

**GROUNDWATER QUALITY BASELINE  
SAMPLING AND ANALYSIS PLAN  
IR SITE 7, BOX CANYON LANDFILL  
CAMP PENDLETON, CALIFORNIA**

**Environmental Remedial Action  
Contract No. N62474-98-D-2076  
Contract Task Order 0080**

**Document Control Number 4434  
Revision 1**

**January 15, 2003**

Submitted to:

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Southwest Division  
Naval Facilities Engineering Command  
Environmental Division  
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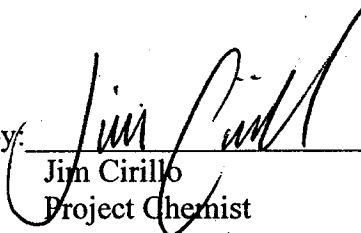
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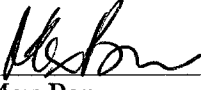
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DRAFT GROUNDWATER QUALITY BASELINE  
SAMPLING AND ANALYSIS PLAN  
SITE 7 – BOX CANYON LANDFILL  
REVISION 0

DATED 03 OCTOBER 2002

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Appendix B	Response to Review Comments

## ***Abbreviations and Acronyms***

amu	atomic mass unit
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CTO	contract task order
DEH	San Diego Department of Environmental Health
DHS	Department of Health Services
DOD	Department of Defense
DOT	U.S. Department of Transportation
DQAR	data quality assessment report
DQO	data quality objective
DTSC	Department of Toxic Substances Control
EDD	electronic data deliverable
EFA-West	Environmental Field Activity-West
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
ft	foot or feet
GC	gas chromatography
ICP	inductively coupled plasma
IDW	investigation-derived waste
IT	IT Corporation
ITEMS™	IT Environmental Management System
L/min	liter per minute
LCD	laboratory control duplicate
LCS	laboratory control sample
MCLs	maximum contaminant levels
MS/MSD	matrix spike/matrix spike duplicate
MDL	method detection limit
mg/L	milligrams per liter
mL	milliliter
mL/min	milliliters per minute
MS	matrix spike
MSA	method of standard addition
MSD	matrix spike duplicate
NEDTS	Navy Electronic Data Transfer System
NCR	nonconformance report
NFESC	Naval Facilities Engineering Service Center
NIST	National Institute for Standards and Testing
OU-3	Operable Unit Number 3
PARCC	precision, accuracy, representativeness, comparability, and completeness
PE	performance evaluation

## ***Abbreviations and Acronyms (Cont.)***

PID	photoionization detector
PQL	practical quantitation limit
QA	quality assurance
QA/QC	quality assurance/quality control
QAO	Quality Assurance Officer
QC	quality control
RAC	Remedial Action Contract
RD	remedial design
RI	remedial investigation
RL	reporting limit
ROD	record of decision
RPD	relative percent difference
RWQCB	California Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SARA	Superfund Amendment and Reauthorization Act
SDG	sample delivery group
SIM	selected ion monitoring
SOP	Standard Operating Procedure
SVOC	semivolatile organic compound
SWDIV	Southwest Division
T&D	transport and disposal
TOC	total organic carbon
VOA	volatile organic analysis
°C	degrees Celsius
µg/L	micrograms per liter

## 1.0 Introduction

---

IT Corporation (IT) has prepared this Sampling and Analysis Plan (SAP) to address the requirements for collection and analysis of groundwater samples located in and around Box Canyon Landfill at Marine Corps Base Camp Pendleton, California.

This work will be conducted for the U.S. Department of the Navy (DON) Southwest Division Naval Facilities Engineering Command (Navy) under Contract No. N62474-98-D-2076.

This SAP is based on the requirements of the following documents:

- *U.S. Environmental Protection Agency (EPA) Requirements for QAPPs, EPA QA/R-5* (EPA, 2001)
- *Guidance for the Data Quality Objectives Process, EPA QA/G-4* (EPA, 2000)
- *Naval Facilities Engineering Service Center Navy Installation Restoration Chemical Data Quality Manual* (Naval Facilities Engineering Service Center [NFESC], 1999)
- U.S. Army Corps of Engineers (USACE), *Requirements for the Preparation of Sampling and Analysis Plan, 1994*
- U.S. Navy Southwest Division (SWDIV), *Environmental Work Instruction 3EN2.1- Chemical Data Validation* (SWDIV, 2001a)
- U.S. Navy SWDIV, *Environmental Work Instruction 3EN2.2- Review, Approval, Revision, and Amendment of Field Sampling Plans and Quality Assurance Project Plans* (SWDIV, 2001b)
- U.S. Navy SWDIV, *Environmental Work Instruction 3EN2.3- Laboratory Quality Assurance Program* (SWDIV, 2001c).

This SAP is a controlled document that IT will distribute to all members of the project team. It is required reading for all staff participating in the data collection method, and it will be in the possession of the field teams and of the laboratories performing analytical work.

This SAP has been prepared to ensure that the data collected over the course of the project are of known quality to meet their intended use, and that all components of data acquisition are thoroughly documented, verifiable, and defensible. This document describes the project data quality objectives (DQO) and, based on these DQOs, derives appropriate quality assurance (QA) objectives and quality control (QC) requirements to ensure that the acquired data are valid and usable. The SAP outlines the sampling strategy and design; establishes the field procedure

requirements; and the criteria for data quality in terms of the precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters. The SAP complies with *EPA Requirements for QAPPs*, QA/R-5, (EPA, 2001). The QAPP elements are categorized into four groups that have been addressed in the SAP as follows:

- Group A. Project Management
  - Title and approval sheet
  - Table of contents
  - Project/task organization - Section 1.3
  - Data quality objectives - Section 2.0
  - Documentation and records - Sections 6.0 and 10.0
- Group B. Measurement/Data Acquisition
  - Sampling method requirements - Section 5.2
  - Sample handling and custody requirements - Sections 4.0, 5.1, and 5.2
  - Analytical method requirements - Section 2.1.7
  - Quality control requirements - Sections 2.1.1 and 7.0
  - Instrument/equipment testing, inspection and maintenance requirements - Sections 5.4 and 8.3
  - Instrument calibration and frequency - Section 8.2
  - Acceptance requirements for supplies and consumables - Section 8.5
- Group C. Assessment/Oversight
  - Assessments and response actions - Section 11.1
  - Reports to management - Section 10.3
- Group D. Data Validation and Usability
  - Data review, validation, and verification requirements - Section 10.1
  - Validation and verification methods - Section 10.1.2

## **1.1 Site History and Background**

Marine Corps Base Camp Pendleton operated the Box Canyon Landfill (site) between May 1974 and May 1984 as a Class II (non-hazardous) solid waste facility, which accepted waste that the base generated. The site accepted an estimated 1,093,000 cubic yards of waste during the 10-year operation. The base identified the site as IR (installation restoration) Site 7 in the

Federal Facility Agreement (FFA), which the base, EPA Region IX, California Department of Toxic Substances Control (DTSC), and San Diego Department of Environmental Health (DEH) signed in October 1990. The FFA was established pursuant to the process mandated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the 1986 Superfund Amendment and Reauthorization Act (SARA) for conducting environmental cleanup and restorations at the base.

The FFA program segregated the base IR sites into four groups:

- Group A – Sites with previous investigations prior to FFA establishment
- Group B – Landfills and surface impoundments
- Group C – Remaining sites in the Santa Margarita River basin
- Group D – Remaining sites outside the Santa Margarita River basin.

In this grouping process, IR Site 7 was placed and investigated as part of Group B sites in the Remedial Investigation (RI) phase in 1993. Several rounds of groundwater sampling and investigations were conducted between 1993 and 1995. The final remedy for IR Site 7 was issued under the Record of Decision (ROD) for Operable Unit Number 3 (OU-3) in January 1999. The site has been under closure construction since July 2001. A 6-foot-thick (minimum) earthen closure cover was completed in December 2001 in accordance with remedial design (RD) developed pursuant to the OU-3 ROD. The site closure will be fully completed by October 2002, with the addition of drainage systems and perimeter roads that are currently under construction.

A total of 22 groundwater wells (Figure 1-1) were installed at or near the site during the previous site investigations. The wells were used to monitor whether the site impacted the quality of the groundwater. Although the groundwater level in these wells has been monitored since October 2001, none of the wells have been sampled since August 1995. The well construction details, based on previous boring logs and monitoring results, are presented in Table 1-1.

## **1.2 Scope and Objectives**

The primary objective of this SAP is to implement a comprehensive plan of groundwater sampling at Box Canyon Landfill so a groundwater quality baseline can be established for the post-closure monitoring activities. The baseline results will be evaluated against previous monitoring results so the site groundwater hydrology and geochemistry can be verified. The baseline study data will then be used to develop a site-specific post-closure monitoring plan. The post-closure activities would be implemented on a quarterly basis.

Since the wells have not been sampled for 7 years, the conditions of the wells are not known. As a secondary objective of this SAP, all 22 wells will be investigated as part of the baseline sampling activities. Wells will be inspected, surveyed, and repaired, as required, for suitability in order to achieve the post-closure monitoring goals. The results of the well inspections will also be used to establish the post-closure monitoring plan.

This SAP establishes the basic sampling protocols by detailing field sampling activities, field QC procedures, and data gathering methods. This SAP also defines the data quality objectives (DQOs) and the specific QA and QC activities that will be used to achieve project goals.

A draft version of this SAP (IT, 2002) was reviewed by the parties to the FFA. The review comments and responses are provided in Appendix B. The draft version was revised in accordance with the responses to review comments. This SAP will be modified, if necessary, and finalized in the site-specific post-closure monitoring plan.

### **1.3 Project Organization**

The project organization consists of representatives from the Navy, providing technical direction and QA oversight, and the IT Team. The project organization, which is shown in Figure 1-2, consists of the following members:

- Remedial Project Manager, Southwest Division
- U.S. Navy Quality Assurance Officer (QAO)
- Program Manager, IT
- Program QC Manager, IT
- Program QA Manager, IT
- Technical Lead, IT
- Database Manager, IT
- Site Superintendent, IT
- Program Health and Safety Manager, IT
- Manager of Field Analytical Services, IT
- Project QC Manager, IT
- Project Manager, IT
- Site Health and Safety Specialist, IT
- Project Contractor Quality Control Representative, IT
- Project Chemist, IT
- Field Chemist/Technologist, IT
- Technical Manager, IT
- Project Engineer, IT
- Project, Geologist, IT
- Field Labor, IT

- Project Superintendent, IT
- Project Business Administrator, IT
- Cost Schedule Engineer.

The responsibilities of the team members associated with data acquisition activities are presented in Table 1-2. All field activities will be coordinated with Camp Pendleton's Program Manager.

## **2.0 Quality Assurance Objectives**

---

DQOs are qualitative and quantitative statements that clarify the project objectives, specify the most appropriate type of data for the project decisions, determine the most appropriate conditions from which to collect data, and specify tolerable limits on decision errors. DQOs are based on the end uses of the data and are determined through a seven-step process as described in QA/G-4 (EPA, 2000).

In addition to the project objectives, the DQOs specify data collection boundaries and limitations, the most appropriate type of data to collect, and the level of decision error that will be acceptable for the decision.

### **2.1 Data Quality Objectives**

The DQO process is a series of planning steps based on scientific methods that are designed to ensure that the type, quantity, and quality of environmental data used for decision-making are appropriate for the intended application. The DQO process, as defined by EPA, consists of seven steps that are designed to provide a systematic approach to resolving issues that pertain to the site investigation and remediation (EPA, 2000). This section of the QAPP describes the outcome of the seven-step DQO process for data collection activities under this CTO. The DQOs for the baseline groundwater sampling at Box Canyon Landfill are presented in the following sections.

#### **2.1.1 Stating the Problem**

A post-closure groundwater-monitoring program has been proposed for Box Canyon Landfill located at IR Site 7, Marine Corps Base Camp Pendleton. The wells identified for groundwater monitoring and described in this SAP have not been sampled since August 1995. Consequently, a baseline groundwater-sampling event will be conducted to provide hydrogeologic and geochemical information to be used in the preparation of a post-closure monitoring plan.

#### **2.1.2 Identifying the Decisions**

The principal study questions for this project are as follows:

- In what physical and structural condition are the 22 groundwater wells specified in Figure 1-1?
- What is the current site groundwater hydrology and geochemistry of the groundwater surrounding Box Canyon Landfill?

To this end, the following will be performed:

- Conduct a survey of the 22 groundwater wells in Figure 1-1.
- Measure depth-to-water and depth-to-bottom for all 22 wells to be sampled and monitoring well IDW-01.
- Repair all wells in unsatisfactory condition.
- Collect groundwater samples from each of the 22 groundwater wells and have them analyzed for the tests listed in Section 2.2.7.

Data derived from the baseline groundwater sampling will be used to develop the post-closure monitoring program.

### **2.1.3 Identifying Inputs to the Decisions**

The following are inputs to the decisions:

- The condition of the 22 groundwater wells
- Groundwater data derived from field measurements and laboratory analysis
- Analytical test results for concentrations of regulated contaminants in the waste materials.

### **2.1.4 Defining the Boundaries**

Twelve of the 22 groundwater wells identified in Figure 1-1 were last sampled during the second quarter of 1995, and indicated the presence of nickel and selenium. Carbon tetrachloride and 1,2-dichloroethane were also detected during sampling events prior to the last sampling event.

Baseline groundwater samples will be collected in 4 weeks after the SAP approval. Sample collection is expected to require no more than 1 week.

It is expected that all 22 wells will be sampled; however, it is possible, although not likely, that one or more wells will be in such a condition that sample collection will not be possible. For example, a broken well casing could allow the surrounding filter pack to partially fill the well volume, and, therefore, prohibit purging and sampling.

### **2.1.5 Developing a Decision Rule**

The principal decision rules are as follows:

- If a well is damaged, the site supervisor and the project manager will determine if the well can be repaired in a timely and cost-effective manner.

- If a well is found to have accumulated silt greater than 10 percent of the well screen interval or that the screen interval is impaired by bio-growth, the well will be redeveloped.
- If a contaminant is detected at or above its MCL, then the contaminant will be included in the "Post-Closure Monitoring Plan for the Box Canyon Landfill."
- If a contaminant is detected and does not have an MCL, then the contaminant concentration will be compared to a risk-based action level. If the contaminant detected exceeds the risk-based concentration, then the contaminant will be included in the "Post-Closure Monitoring Plan for the Box Canyon Landfill."
- If a contaminant is detected below its MCL or a risk-based action level, the contaminant will not necessarily be excluded as a contaminant of concern. Inclusion of contaminants in the "Post-Closure Monitoring Plan for the Box Canyon Landfill" meeting either of these criteria will be made on a case-by-case basis.

Contaminants detected in the groundwater at the site will likely require further monitoring in subsequent groundwater collection actions. The number of groundwater collection events that will be recommended in the "Post-Closure Monitoring Plan for the Box Canyon Landfill" will depend upon the health risk associated with the contaminant.

### ***2.1.6 Specifying Limits on Decision Error***

Statistically derived limits on sampling design errors are not quantifiable because a judgmental sampling design will be employed. The number and location of samples to be located are based on professional experience.

### ***2.1.7 Optimizing the Design for Obtaining Data***

Professional judgment and previously collected data were used to select the sample locations and well installations for this project. The most cost-effective design has been proposed for this work.

## ***2.2 Analytical Quality Assurance/Quality Control Data Quality Objectives***

Analytical data will be obtained in a certified laboratory using standard methods and will be assessed through measures of PARCC parameters. The QC criteria are defined in this section, along with analytical methods and project-required reporting limits.

### ***2.2.1 Accuracy***

Accuracy is the nearness of a result or the mean of a set of results to the true or accepted value and measures the bias of an analytical system by comparing the difference of a measurement

with a reference value. The percent recovery of an analyte, which has been added to the environmental samples at a known concentration before extraction and analysis, provides a quantitation tool for analytical accuracy. The spiking solutions used for accuracy determinations are not used for instrument calibrations.

The following equation illustrates how accuracy is evaluated:

$$\text{Accuracy as percent recovery} = \frac{\text{Spiked Sample Result} - \text{Sample Result}}{\text{Spike True Value}} \times 100\%$$

Percent recoveries for matrix spike (MS), matrix spike duplicate (MSD), and laboratory control standard (LCS) that are analyzed for every batch of up to 20 samples serve as a measure of analytical accuracy.

EPA SW-846 mandates the recovery acceptance limits for metal analysis at 75 to 125 percent.

Control limits are defined as the mean recovery, plus or minus three standard deviations, of the 20 data points, with the warning limits set as the mean plus or minus two standard deviations. The laboratory will review the QC samples and surrogate standard recoveries for each analysis to ensure that internal QC data are within the limits of acceptability. The laboratory will investigate any suspect trends and take appropriate corrective actions.

### **2.2.2 Precision**

Precision measures the reproducibility of measurements under a given set of conditions. Analytical precision is the measurement of the variability associated with duplicate or replicate analyses. For this project, a LCS will be used to determine the precision of the analytical method. Total precision is the measurement of the variability associated with the entire sampling and analysis process. It is determined by analysis of duplicate field samples and measures variability introduced by both the laboratory and field operations. Field duplicate and matrix spike duplicate samples will be used to assess field and analytical precision. The precision measurement expressed as the relative percent difference (RPD) between the duplicate sample results. The following equation illustrates the method for calculating RPD to assess a method's precision:

$$\text{Precision as RPD} = \frac{2 \times (\text{Result} - \text{Duplicate Result})}{\text{Result} + \text{Duplicate Result}} \times 100\%$$

The laboratory uses MS/MSD pairs to assess the precision of analytical procedures, with one MS/MSD pair analyzed for every batch of up to 20 samples. According to the Navy requirements, analytical laboratories perform MS/MSD on the Navy project samples. This helps determine whether matrix interferences may be present.

The laboratory uses LCS/laboratory control duplicate (LCD) pairs when MSs are not practical because of the nature of the sample or analytical method used, and they are prepared and analyzed with each batch of samples instead of MS/MSD. LCS/LCD may also be prepared in place of MS/MSD in the case that a sufficient sample volume was not obtained in the field to perform the MS/MSD analysis. For inorganic analyses, analytical precision is usually calculated based on the sample and sample duplicate results.

The analytical laboratory will have statistically based acceptability limits for RPDs established for each method of analysis and sample matrix. The laboratory will review the QC samples to ensure that internal QC data are within the limits of acceptability. Any suspect trends will be investigated and corrective actions taken. If the laboratory does not have statistically derived control limits, the analytical precision acceptability limits for this project will be as follows:

**Water:** 20 percent for all analyses

Field precision of sampling procedures is evaluated by collecting and analyzing “blind” field duplicate samples (field QC samples) at a rate of 1 for every 10 samples. Sampling precision will be evaluated based on the RPD for field duplicate samples. The field precision acceptability limits will be as follows:

**Water:** 30 percent for all analyses

Field precision will be monitored for evaluating the sampling techniques and sample handling procedures. Analytical data will not be qualified during the data validation process, based on the field precision values.

### **2.2.3 Representativeness**

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Unlike precision and accuracy, which can be expressed in quantitative terms, representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. Representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or

an environmental condition. It is a qualitative parameter that depends on proper design of the sampling program.

Field personnel will be responsible for ensuring that samples are representative of field conditions by collecting and handling samples according to approved SAP and standard operating procedures (SOPs). Errors in sample collection, packaging, preservation, or chain-of-custody procedures may result in samples being judged nonrepresentative and may form a basis for rejecting the data.

Data generated by the laboratory must be representative of the laboratory database of accuracy and precision measurements for analytes in different matrices. Laboratory procedures for sample preparation will ensure that aliquots used for analysis are representative of the whole sample. Aliquots to be analyzed for volatile parameters will be removed before the laboratory composites/homogenizes the samples, to avoid losing volatile compounds during mixing.

#### **2.2.4 Comparability**

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another, whether it was generated by a single laboratory or during interlaboratory studies. Sample data should be comparable with other measurements for similar samples and sample conditions. The objective for the QA/QC program is to produce data with the greatest possible degree of comparability. The number of matrices sampled and the range of field conditions encountered are considered in determining comparability. The use of standardized field and analytical procedures ensures comparability of analytical data.

Sample collection and handling procedures will adhere to EPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units, standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements.

#### **2.2.5 Completeness**

Completeness is a measure of whether all of the data necessary to meet the project have been collected. The data must meet all acceptance criteria, to be considered complete including accuracy and precision, and other criteria specified for an analytical method. The data will be reviewed or validated to keep invalid data from being processed through data collection.

Completeness is evaluated using the following equation:

$$\text{Completeness} = \frac{\text{Acceptable Results}}{\text{Total Results}} \times 100\%$$

The goal for completeness for all QC parameters, except holding times, will be 90 percent. The goal for holding times will be 100 percent. If these goals are not achieved, the sources of nonconformances will be evaluated to determine whether resampling and reanalysis is necessary.

## **2.2.6 Analytical Methods**

Analytical methods will include standard EPA (1983 and 1996) methods. The methods that will be used are listed below:

- VOCs by EPA Method 8260B
- Semivolatile organic compounds (SVOCs) by EPA Method 8270C
- Benzo(a)pyrene by EPA Method 8270C - Selected Ion Monitoring (SIM)
- Organochlorine pesticides by EPA Method 8081A
- Pentachlorophenol by EPA Method 8151A
- California Code of Regulations (CCR), Title 22, metals by EPA Method 6020, total and dissolved
- Sodium, calcium, potassium, iron, manganese, and magnesium by EPA Method 6010B, total and dissolved
- Mercury by EPA Method 7470A, total and dissolved
- Dissolved methane by RSK-175
- Nitrate/nitrite by EPA Method 353.3
- Carbonate/bicarbonate by EPA Method 310.1
- Chloride/sulfate by EPA Method 300.0
- Total organic carbon (TOC) by EPA Method 415.1
- Ammonia by EPA Method 350.2
- Total dissolved solids by EPA Method 160.1.

### **2.2.7 Project-Required Reporting Limits**

Project-required reporting limits are identified in Table 2-1.

### **2.2.8 Project-Required Control Limits**

Precision and accuracy QC limits for each method and matrix are identified in Table 2-2.

## **3.0 Monitoring Well Assessment**

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This section summarizes the procedures for determining the condition of the 22 monitoring wells shown in Figure 1-1, which have not been sampled since 1995.

### **3.1 Monitoring Well Inventory**

The condition of the 22 monitoring wells shown in Figure 1-1 must be inspected according to, but, not limited to, the following items:

- Adequate access
- Well-cover integrity (flush-mounted wells)
- Well-vault integrity (flush-mounted wells)
- Well-monument integrity (aboveground wells)
- Bollard integrity (aboveground wells)
- Exposed well-casing integrity
- Debris within well casing
- Presence of sand in groundwater, which could indicate a broken well screen
- Accumulated silt.

Any damage to a well that could impact sampling will be repaired prior to sampling and will be coordinated with the site superintendent or the project manager prior to sampling.

A water-level probe with 0.01-foot (ft) increments will be used to determine depth to water and the bottom of the well. Depths will be measured from the top of the well casing. Wells with accumulated silt reaching at least the midpoint of the well screen will require redevelopment prior to sampling, which will be coordinated with the site superintendent or project manager. Well screen intervals are presented in Table 1-1.

In addition, survey coordinates for each well, including top of casing, top of monument, and ground surface elevations, will be measured by an approved subcontractor prior to sampling.

## **4.0 Sampling and Analysis Strategy**

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This section describes the sampling strategies that will be implemented to support the Site 7 baseline groundwater sampling at Box Canyon Landfill in Camp Pendleton. The laboratory analyses will be conducted in accordance with EPA (1983, 1996, and 1997) procedures.

Groundwater sampling procedures are described in Section 5.3.

### **4.1 Baseline Groundwater Sampling**

Baseline groundwater samples will be collected from all 22 wells at Site 7. The sampling locations are presented in Figure 1-1. The groundwater samples will be tested for the following parameters:

- VOCs by EPA Method 8260B
- SVOCs by EPA Method 8270C
- Benzo(a)pyrene by EPA Method 8270C - SIM
- Organochlorine pesticides by EPA Method 8081A
- Pentachlorophenol by EPA Method 8151A
- CCR, Title 22, metals by EPA Method 6020, total and dissolved
- Sodium, calcium, potassium, iron, manganese, and magnesium by EPA Method 6010B, total and dissolved
- Mercury by EPA Method 7470A, total and dissolved
- Dissolved methane by RSK-175
- Nitrate/nitrite by EPA Method 353.3
- Carbonate/bicarbonate by EPA Method 310.1
- Chloride/sulfate by EPA Method 300.0
- TOC by EPA Method 415.1
- Ammonia by EPA Method 350.2
- Total dissolved solids by EPA Method 160.1.

## **4.2 Investigation-Derived Waste**

Transport and disposal (T&D) of investigation-derived waste (IDW) off the base may require characterization sampling for groundwater generated during well purging and decontamination water. Waste analytical testing will be determined by the requirements of the waste disposal method or facility. Sampling procedures are described in Section 5.3.2. If necessary, IDW will be tested for the following:

- VOCs by EPA Method 8260B
- SVOCs by EPA Method 8270C
- Pesticides by EPA Method 8081A
- Title 22 metals by EPA Method 6020.

Testing may be scaled back if initial analytical results indicate that less testing is appropriate.

## **4.3 Project-Required Reporting Limits**

Project-required reporting limits are identified in Table 2-1.

## **4.4 Field Quality Control Samples**

Field QC samples will be collected and analyzed to assess the consistency and performance of the groundwater sampling activities. Field QC samples for this project will include field duplicates, MS/MSD, equipment rinsates, and trip blanks.

### **4.4.1 Field Duplicates**

Field duplicates are two samples (an original and a duplicate) of the same matrix collected, to the extent possible, at the same time and location and using the same sampling techniques. Field duplicate samples are used to evaluate the precision of the overall sample collection and analysis process. Field duplicates will be collected at a frequency of 1 per 10 groundwater samples and will be analyzed for the full set of analyses used for the groundwater samples from the wells being sampled. Field duplicates receive unique sample numbers; therefore, the identities of the duplicate samples are “blind” to the analytical laboratory. Exact locations of duplicate samples and sample identifications will be recorded in the field logbook.

### **4.4.2 Matrix Spike/Matrix Spike Duplicate**

The laboratory will analyze an MS/MSD for every 20 samples analyzed or for every analytical batch prepared, whichever is more frequent. Field personnel will collect triple the amount or volume of the sample matrix for the designated MS/MSD sample. The MS/MSD sample will be used to determine the precision of the sample preparation and analytical methods.

#### **4.4.3 Equipment Rinsates**

Equipment rinsate samples will be collected at a frequency of one per day for each day that nondisposable or non-dedicated sampling equipment is used. Rinsate samples are generated by running laboratory-supplied source water on or through non-disposable or non-dedicated equipment after the final rinse of the decontamination process. Rinsate samples will be collected from the sampling equipment, placed in appropriate containers supplied by the analytical laboratory, and analyzed for the full set of analyses used for the samples collected that day. Equipment rinsate samples are used to evaluate the effectiveness of the decontamination procedure and the potential for cross-contamination during sampling events.

#### **4.4.4 Trip Blanks**

Trip blanks will be prepared by the laboratory in 40-milliliter volatile organic analysis (VOA) vials with analyte-free water. The trip blanks will be carried into the field, stored, and shipped to the laboratory along with the water samples. One trip blank will be shipped with each cooler that contains water samples to be analyzed for VOCs. Trip blanks are evaluated to determine whether VOC cross-contamination between samples has occurred during storage and transportation. Trip blanks apply only to volatile organics and must be free of headspace.

#### **4.4.5 Temperature Blanks**

Each cooler will be shipped with a temperature blank. A temperature blank is a sample container filled with tap water and stored in the cooler during sample collection and transportation. The laboratory will record the temperature of the temperature blank immediately upon receipt of the samples. If samples are received at the laboratory less than 8 hours after collection, they may not have had sufficient time to cool to the required 2 to 6 degrees Celsius (°C).

## **5.0 Field Methods and Sampling Procedures**

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This section describes the procedures that will be implemented by the IT field personnel for sampling, equipment decontamination, and sample management in the field. This section also describes the procedures for field collection, analysis, and handling of water samples. Samples will be collected in accordance with the procedures outlined in the following sections.

Groundwater monitoring locations are shown on Figure 1-1.

### **5.1 Sample Containers, Preservatives, and Holding Times**

The volume and type of containers and the preservatives to be used for field and laboratory analyses must comply with EPA protocols and laboratory-specific requirements, as stated in the laboratory quality assurance/quality control (QA/QC) plan. Certified precleaned containers will be provided by the subcontract laboratory. Table 5-1 lists container, preservative, and holding time requirements by analysis.

### **5.2 Sampling Method Requirements**

Samples will be collected according to IT SOP PR00-1, presented in Appendix A.

### **5.3 Baseline Groundwater Sampling Procedures**

Appendix A describes in detail the low-flow purging and sampling procedures to be used for this project. The following steps summarize the procedures for purging wells, determining when water-quality parameters have stabilized, and collecting samples using low-flow groundwater sampling techniques:

- At each well, remove the well cap and check the wellhead for organic vapors using a photoionization detector (PID).
- Conduct the following steps prior to purging:
  1. Measure the groundwater level to the nearest 0.01 foot using a decontaminated water-level indicator. Measure the water level from a marked survey point on the top of the casing within the protective wellhead. Record all readings in the groundwater purge log.
  2. Secure dedicated, precut polyethylene tubing to a clean pump. Slowly lower the pump into the well, minimizing disturbance of the well water. The pump should be situated at the approximate midpoint of the well screen or the midpoint of the saturated section of the well screen. Once the pump is in place, allow at least 15 minutes to elapse so that the well water reaches equilibrium with the formation water.

3. Attach the pump to a compressed air source so that the flow rate is approximately 120 to 500 milliliters per minute (mL/min). Determine the flow rate by measuring the time to fill a known volume (e.g., graduated cylinder).
4. Confirm that draw down on the water column is no more than 0.3 ft below initial depth to water through use of the draw down meter or water-level indicator. The purge flow rate will be reduced appropriately if the drawdown at any time exceeds 0.3 feet below initial depth to water.
5. When using calibrated portable field instruments, measure the temperature, pH, dissolved oxygen, oxidation-reduction potential, turbidity, and electrical conductivity at the outset of purging and then at regular intervals. When using a flow-through cell (e.g., QED™ PURGESCAN™ or equivalent), calibrate the equipment, set stabilization criteria, and record final parameter measurements. Record water-quality measurements in the groundwater purge log and compare against the criteria in Table 5-2. For calibrated portable field instruments, when the last three sets of measurements meet the criteria, purging will be considered adequate. If the measurements do not meet the criteria, additional increments of well water will be purged until the measurements for the water quality parameters meet the criteria.
6. Wear new, clean, chemical-resistant gloves. Fill the appropriate sample bottles according to Table 5-1 for the requested analyses from the purge outlet line while maintaining an approximate flow rate of 100 milliliters per minute (mL/min) while filling VOA vials and 0.5 to 1 L/min while filling the remaining sample containers. Minimize coarse pulsing or spraying of the effluent while filling VOA vials. Samples for dissolved metals will be collected by connecting a new and unused disposable 0.45-micron inline filter to the purge outlet line and dispensing filtered groundwater into the appropriate container. For MS/MSD samples, collect three sets of bottles.
  - Cap the bottles and wipe any moisture from the outside of the bottle.
  - Place a sample label, completed with the information described in Section 5.7.2 on each bottle.
  - Place each bottle in a resealable bag.
  - Immediately place the resealable bag in a cooler with bagged ice.
  - Record the sample number, date, time, and description on the chain-of-custody form and in the field logbook. Write all entries in indelible black ink.

Samples will be packaged and shipped in accordance with the procedures presented in Section 5.7.3.

During collection of liquid samples, multiple sample containers may be submitted for key analyses so that a backup sample is available in the event of breakage during transport to the laboratory.

### **5.3.1 Volatile Organic Analysis Sampling**

VOA sampling requires a special collection technique, therefore, field sampling will be planned in advance. It will be conducted in consideration of the following conditions:

- Field sampling must be performed in a manner that prevents aeration or mixing of the sampling material.
- Handling and storage of samples must be performed in a manner that prevents exposure of the sample to elevated temperatures at any point during the process.
- Exposure of samples to air must be minimized.

VOA samples will be collected as follows:

- Carefully collect the water samples in preserved 40-milliliter (mL) VOA vials, minimizing aeration.
- Fill the vial to the lid until a positive meniscus is formed.
- Cap the vial immediately and slowly.
- Check the sample for the presence of air bubbles.
- If any air bubbles are present, discard the collected sample and resample using a new vial.
- Repeat the previous steps until an air bubble-free sample is collected.

Samples will be packaged and shipped in accordance with the procedures presented in Section 5.7.3.

### **5.3.2 Waste Characterization Sampling Procedures**

Project-generated waste will consist of groundwater from well purging, decontamination water, and discarded personal protective clothing. Well purged water will be stored on site in 55-gallon drums for subsequent transportation to an appropriate disposal facility. The project T&D coordinator, in consultation with the disposal facility, will determine whether any analytical testing is required. Otherwise, analytical results from groundwater sampling will be used to characterize the water for disposal.

## Liquid Waste

If required, liquid waste samples will be collected as follows:

- Use new disposable bailers and wear new, clean, chemical-resistant gloves during sample collection.
- Retrieve the bailer and fill appropriate bottles for the analyses being requested.
- Cap the bottles and wipe any moisture from the outside of the bottle.
- Place a sample label, completed with the information described in Section 5.7.2, on each bottle.
- Place each bottle in a resealable bag.
- Immediately place the resealable bag in a cooler with bagged ice.
- Record the sample number, date, time, and description on the chain-of-custody form and in the field logbook. Write all entries in indelible black ink.

## Personal Protective Clothing

No samples of discarded protective clothing will be collected. The analytical results from the groundwater sampling event associated with the discarded clothing will be used to classify the materials.

## **5.4 Equipment Decontamination Procedure**

Decontamination of nondisposable sampling equipment will be performed to prevent the introduction of extraneous material into samples and to prevent cross-contamination between samples. All sampling equipment will be decontaminated by steam-cleaning or by washing with a nonphosphate detergent such as Liquinox™ or equivalent. Decontamination water will be collected in 5-gallon buckets and placed in the 55-gallon drums for temporary storage.

The following steps will be used for general decontamination of nondisposable sampling equipment:

1. **Wash with nonphosphate detergent and water solution.** This step will remove contamination from the equipment. It is suggested that a 5-gallon bucket, approximately 75-percent full of a non-phosphate detergent and water solution, and a long-handled brush be used for this step. Dilute nonphosphate detergent as directed by the manufacturer.
2. **Rinse with potable water.** This step will rinse the detergent solution from the equipment. It is suggested that a 5-gallon bucket, approximately 75-percent full of water, and a long-handled brush be used for this step. Periodic changing of this water is required.

3. **Rinse with deionized water.** This step will rinse away residual detergent solution and potable water. It is suggested that a 5-gallon bucket, approximately 75-percent full of deionized water, be used for this step. Periodic changing of this water is required. An alternative rinsing method involves applying deionized water from a stainless steel Hudson-type sprayer or Nalgene™ squeeze bottle while holding the equipment over a 5-gallon bucket.

## **5.5 Field Measurement Procedures**

Field water-quality measurements will be taken using either calibrated portable instruments or a flow-through cell. The instruments will be capable of measuring dissolved oxygen, oxidation-reduction potential, pH, temperature, electrical conductivity, and turbidity. Instrument calibration and analytical procedures will be in accordance with the manufacturer's instruction manual for the instrument.

### **5.5.1 Dissolved Oxygen, Oxidation-Reduction Potential, Electrical Conductivity, pH, Temperature, and Turbidity**

Field measurements, other than turbidity, will be taken using a YSI™ multimeter, QED™ PURGESCAN™ flow cell, or equivalent. Turbidity will be measured using a HF Scientific DRT-15CE or equivalent. Instrument calibration and sample measurement procedures will be in accordance with the manufacturer's instruction manual. Results of manufacturer-recommended calibration checks will be recorded in a calibration logbook.

If the vendor has not calibrated the multimeter or flow cell for dissolved oxygen at or near the elevation of Camp Pendleton, it must be recalibrated and adjusted for atmospheric pressure prior to use. The membrane on the dissolved oxygen probe must be periodically checked for integrity and will be replaced according to manufacturer's specifications if found to be torn or if air bubbles are distinguishable under the membrane.

Field samples will be analyzed after instrument calibration is performed according to the manufacturer's instruction manual for the instrument. Results will be recorded as follows: dissolved oxygen to the nearest 0.1 milligrams per liter (mg/L), oxidation-reduction potential to the nearest 0.1 millivolt, conductivity to the nearest 0.1 milli-Siemen per centimeter, pH to the nearest 0.1 pH unit, temperature to the nearest 1°C, and turbidity to the nearest 0.01 nephelometric turbidity.

### **5.5.2 Water-Level Measurement Instrument**

Water levels will be measured using a water-level indicator with a precalibrated measuring tape attached directly to the probe. The meter will come fully calibrated by the manufacturer, with

graduations in English units. The tape will be inspected, before use, for missing or defective graduation marks. Water levels will be recorded to the nearest 0.01 foot. The measuring tape will be decontaminated per Section 5.4 between wells.

## **5.6 Field Instrument Operation**

Field instruments that will be utilized for this work include a PID and a water quality meter. Readings will be recorded in a field logbook. Both instruments will be calibrated once daily per the manufacturer's specifications.

## **5.7 Sample Handling Procedures**

This section describes the requirements for sample numbering and labeling as well as packaging and shipment. Documentation procedures are described in Section 6.0 of this document.

### **5.7.1 Sample Numbering**

All samples submitted to an off-site laboratory will be uniquely numbered according to the following format:

XXXXXX - YYYY

Where "XXXXXX" is the six-digit IT project number (i.e., 829771) and "YYYY" is a sequential number generated at the time of sample collection. It must be recorded on the chain-of-custody form and in a bound field logbook at the time of sample collection. A complete description of the sample and sampling circumstances will be recorded in the field logbook and referenced to the unique sample identification number.

### **5.7.2 Sample Labeling**

Sample labels are used to prevent misidentification of samples. Labels will be filled out and affixed to sample containers at the time of sample collection. Sample labels will be completed using indelible black ink and will be affixed to each sample container. Sample containers will be placed in resealable plastic bags to protect the sample labels from moisture during transportation to the laboratory. Each sample container will be labeled with the following, at a minimum:

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock)
- Project number (i.e., 829771)
- Sampler's initials
- Analyses to be performed

- Preservation (if any)
- Location (i.e., Site 7, Box Canyon Landfill).

### **5.7.3 Sample Packaging and Shipment**

Packaging of the sample containers will be based on the level of protection a sample will require during handling, shipping, and storage. Packaging may vary according to sample type, sample media, suspected amount of hazardous substances, required testing, and handling and storage conditions. Proper packaging will be based on the following considerations:

- Type and composition of inner packing (e.g., plastic bags, metal cans, absorbent packing material, and ice for preservation)
- Type and composition of overpacks (e.g., metal or plastic coolers, cardboard box)
- Method of overpack sealing (e.g., strapping tape, custody seals)
- Marking and labeling of overpacks (e.g., laboratory address, any appropriate U.S. Department of Transportation (DOT) Hazard Class Labels, and handling instructions).

Sufficient space between sample containers will be provided to place ice. Cooler lids will be secured with clear tape on both ends of the cooler. Signed and dated custody seals will be placed over opposite ends of the cooler lid and secured with clear tape. All glass sample containers will be protected with plastic bubble wrap material. A temperature blank will be placed in every cooler with the samples.

Samples to be shipped by commercial carrier will be packed in a sample cooler. Two to four inches of adsorbent packing material (e.g., Vermiculite™) will be placed in the bottom of the sample cooler. Ice, double bagged in resealing bags, will be added to the cooler in sufficient quantity to keep the samples cooled to  $4 \pm 2$  °C for the duration of the shipment to the laboratory. Sample cooler drain spouts will be taped closed from the inside and outside of the cooler to prevent leakage. Saturday deliveries will be coordinated with the laboratory.

If the samples are picked up by a laboratory courier service, the chain-of-custody form will be completed and signed by the laboratory courier. The cooler will then be released to the courier for transportation to the laboratory.

If a commercial carrier is used, the chain-of-custody form will include the airbill number in the “transfers accepted by” column and will be sealed in a resealable bag. The chain-of-custody form will then be taped to the inside of the sample cooler lid. The cooler will be taped shut with strapping tape, and two custody seals will be taped across the cooler lid: one seal in the front and

one seal in the back. Clear tape will be applied to the custody seals to prevent accidental breakage during shipping. The samples will then be shipped to the analytical laboratory. A copy of the courier airbill will be retained for documentation.

The shipping of samples to the analytical laboratory by land delivery services will be performed according to DOT regulations. International Air Transportation Association regulations will be followed when shipping samples by air courier services. Transportation methods will be selected to ensure that the samples arrive at the laboratory in time to permit testing according to established holding times and project schedules. No samples will be accepted by the receiving laboratory without a properly prepared chain-of-custody record and properly labeled and sealed shipping container.

## **6.0 Sample Custody and Documentation**

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An overriding consideration for data resulting from laboratory analyses is the ability to demonstrate that the data are legally defensible (i.e., that the samples were obtained from the locations stated and that they reached the laboratory without alteration). To accomplish this, evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal will be documented through the chain-of-custody record. A sample is considered to be in custody if the following applies to the sample:

- It is in actual possession or in view of the person who collected the samples.
- It is locked in a secure area.
- It is placed in an area restricted to authorized personnel.
- It is placed in a container and secured with an official seal, such that the sample cannot be reached without breaking the seal.

This section describes sample custody and field documentation procedures that IT will follow at the project site. Samples, on project sites, will be stored in locked refrigerators at 2 to 6°C. Sample custody will be the responsibility of the project chemist or an on-site designee from the time of sample collection until the samples are accepted by the courier service for delivery to the laboratory. Thereafter, the laboratory performing the analysis will maintain custody.

### **6.1 Chain-of-Custody**

Chain-of-custody forms will be filled out for all samples to establish the documentation necessary to trace sample possession from the time of collection. The chain-of-custody record lists each sample and the individuals performing the sample collection, shipment, and receipt. The following information will be recorded on the chain-of-custody form:

- Project name
- Project location
- Project number (IT) (i.e., 829771)
- Project contact (IT)
- Client representative (DON)
- Project manager (IT)
- Sample numbers
- Date (of sample collection)
- Time (of sample collection to the nearest minute, military time)
- Sample type (composite or grab)

- Sample description (location and matrix)
- Number of sample containers
- Analysis required
- Remarks
- Data reporting level for samples (i.e., EPA Level III or IV)
- MS/MSD samples
- Observations specific to sample
- Item numbers (to be relinquished)
- Courier/laboratory representative's signature for commercial carrier (record waybill number here)
- Date/time (of custody transfer)
- Additional remarks
- Transportation method
- Laboratory name
- Compositing instructions
- Turnaround time required
- Sampler's signature.

Figure 6-1 presents a copy of the chain-of-custody record that will be used for the EFA–West Environmental Remedial Action Contract (RAC) projects. Figure 6-2 presents an example of a custody seal used to seal a cooler containing samples during transportation to the laboratory.

## **6.2 Analysis Request**

In addition to providing a custody exchange record for the samples, the chain-of-custody record serves as a formal request for sample analyses. The chain-of-custody records will be completed, signed, and distributed as follows:

- One copy will be retained by the sample coordinator for inclusion in the project files.
- The original will be sent to the analytical laboratory with the sample shipment.

After the laboratory receives the samples, the sample custodian will inventory each shipment before signing for it, and note on the original chain-of-custody record any discrepancy in the number of samples, temperature of the cooler, or broken samples. The project chemist will be notified immediately of any problems identified with shipped samples. The project chemist will, in turn, notify the project QC manager and together they will determine the appropriate course of action. The project chemist will also notify the project manager if the project budget and schedule may be impacted.

The laboratory will initiate an internal chain-of-custody that will track the sample within the various areas of the laboratory. The relinquishing signature of the sample custodian and the custody acceptance signature of the laboratory personnel transfer custody of the sample. This procedure is followed each time a sample changes hands. The laboratory will archive the samples and maintain their custody, as required by the contract, or until further notification from the project chemist, at which time the samples will either be returned to the project for disposal or disposed of by the laboratory.

### **6.3 Field Sample Custody**

The chain-of-custody record will be the controlling document to ensure that sample custody is maintained. The chain-of-custody record will be initiated in the field by sampling personnel upon collecting a sample. Each individual who has the sample in his or her possession will sign the chain-of-custody. Each time the sample custody is transferred, the former custodian will sign the chain-of-custody in the "Relinquished By" line, and the new custodian will sign the chain-of-custody in the "Received By" line. The date, time, and the name of the project or company affiliation will accompany each signature.

The waybill number or courier name will be recorded on the chain-of-custody when a commercial carrier is used. The shipping container will be secured with two custody seals, thereby allowing custody to be maintained by shipping personnel until receipt by the laboratory.

If the laboratory sample custodian judges sample custody to be invalid (e.g., custody seals have been broken), the laboratory will initiate a nonconformance report (NCR). The project chemist will be immediately notified. The project chemist will, in turn, notify the project manager and the project QC manager. The project manager will make a decision, in consultation with the client, as to the fate of the sample in question on a case-by-case basis. The sample will either be processed "as-is" with custody failure noted along with the analytical data, or rejected with resampling scheduled, if necessary. The nonconformance associated with the samples will be noted on the appropriate certificate or analysis or case history.

### **6.4 Custody Seals**

Custody seals are used to prevent unauthorized tampering with samples from the time of sample collection through the time of laboratory analysis. The seals will be signed and dated by sampling personnel and then placed on the shipping containers in such a way that they must be broken to open the containers. Seals will be affixed to the containers before the samples leave the custody of the sampling personnel. An example custody seal is presented in Figure 6-2.

## **6.5 Laboratory Sample Custody and Documentation**

Samples will be delivered to laboratory personnel authorized to receive samples, also referred to as the “sample custodian.” The custodian, upon receipt of a sample, will inspect the condition of the sample (including temperature of the cooler) and the custody seal, reconcile the information on the sample label against that on the chain-of-custody form, assign a laboratory number, log the sample in the laboratory logbook, and store the sample in a secured sample storage room. The custodian will record all pertinent observations and measurements on the chain-of-custody form.

The project chemist will be informed immediately of any inconsistencies between the chain-of-custody form and the sample containers received. Any deviation from accepted sample-handling procedures will be documented by the laboratory and reported to the project chemist.

## **6.6 Field Logbooks**

All information pertinent to field sampling will be recorded in a permanently bound field logbook to maintain the integrity and traceability of the samples. The logbook must have consecutively numbered pages, which will be assigned to this project. All entries will be recorded in indelible ink. Corrections will be made by crossing out erroneous data with a single line and then dating and initialing the entry. At the end of each workday, the logbook pages will be signed by the responsible sampler and any unused portions of a logbook page will be crossed out, signed, and dated.

If it is necessary to transfer the logbook to another person, the person relinquishing the logbook will sign and date the last page used, and the person receiving the logbook will sign and date the next page to be used.

At a minimum, the logbook will contain the following information:

- Project name and location (on the front page of the logbook)
- Date and time of collection for each sample (in the upper right corner of each page)
- Sample number
- Sample location (sampling point)
- Sample type (water)
- Composite or grab sample
- Composite type (the number of grab samples)

- Depth of sample
- Weather (rain, sunny, approximate temperature, etc.)
- Containers used (metal liners, glass bottles, etc.)
- Requested analysis
- If prudent, a drawing of or a copy of a map with the sample locations
- Each sample location must be clearly identified on the map
- Field analyses performed, including results, instrument checks, problems, and calibration records for field instruments
- Descriptions of deviations from this SAP
- Problems encountered and corrective action taken
- Identification of field QC samples
- List of QC activities
- Verbal or written instructions from the Navy and IT QC Manager
- Any other events that may affect the samples.

## **6.7    *Electronic Data***

Field information (e.g., date and time collected, sample identification, etc.) will be entered directly into the main database from the chain-of-custody form or uploaded from field-generated electronic files.

Upon receipt, the electronic data will be uploaded into an IT Environmental Management System (ITEMS™) database. Data will be grouped by contract task order (CTO). The uploaded data will then be processed to compare the fields against a list of required values. If any errors are identified, the file will be manually edited or regenerated by the laboratory. If no errors are identified, the data will be uploaded into the main database. The laboratory database will be merged with the field database, and reports will be generated from the merged database.

## **6.8    *Document Corrections***

Changes or corrections on any project documentation will be made by crossing out the item with a single line. The person performing the correction must initial and date the correction. The original item, although erroneous, must remain legible. The new information will be written above the crossed-out item. Corrections will be written clearly and legibly with indelible ink.

## **7.0 Laboratory Quality Control**

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### **7.1 Laboratory Quality Control Checks**

Laboratory QC samples are used to evaluate the performance and reliability of each laboratory measurement parameter. QC samples such as method blanks, MS/MSDs, sample duplicates, and laboratory control standards are used to measure the accuracy and precision of the analytical methods and to evaluate matrix interference. The recovery of known additions is a part of laboratory analytical protocol. The use of additives at known concentrations allows detecting the matrix interferences and estimating the impact of these interferences when present. It also allows evaluating the efficiency of extraction procedures and overall accuracy of analysis. Laboratory internal QC checks will include the following:

- Laboratory control samples
- Laboratory control duplicates
- Matrix spikes
- Matrix spikes duplicates
- Laboratory duplicates
- Method and instrument blanks
- Post-digestion spikes.

#### **7.1.1 Laboratory Control Samples**

An LCS is a purchased sample containing known concentrations of specific target analytes. It can also be prepared by spiking known amounts of target analytes into a well-characterized blank matrix. The matrices will be laboratory reagent water for water samples. The spiking solution used for LCS/LCD preparation is of a source different from the stock that was used to prepare calibration standards. The LCS is prepared and analyzed with the associated samples, using the same reagents. All analytes in the LCS must meet recovery criteria. If the criteria are not met, the entire batch of samples must be reprepared, together with a new LCS, and reanalyzed.

#### **7.1.2 Laboratory Duplicates**

The laboratory duplicate is created by the laboratory; two aliquots are intentionally taken from the same sample and analyzed in parallel. This analysis serves to measure the precision of laboratory operations. Laboratory duplicates will be prepared only for inorganic analyses, at a frequency of one per ten samples.

### **7.1.3 Matrix Spikes**

Matrix spikes are QC check samples that measure matrix-specific method performance. A matrix spike sample is prepared by adding a known quantity of target analytes to a sample before sample digestion or extraction. In general, for metal analyses, an MS/MSD pair is prepared and analyzed with each preparation batch or for every 20 field samples. For inorganic compound analysis, a single MS and a laboratory sample duplicate are often prepared and analyzed with each batch. The LCS results, together with matrix spike results, allow verifying the presence of matrix effects.

### **7.1.4 Surrogate Standards**

Organic compound analyses include the addition, quantitation, and recovery calculation of surrogate standards. Compounds selected to serve as surrogate standards must meet all of the following requirements:

- Are not the target analytes
- Do not interfere with the determination of target analytes
- Are not naturally occurring, yet are chemically similar to the target analytes
- Are compounds exhibiting similar response to target analytes.

Surrogate standards are added to every analytical and QC check sample at the beginning of the sample preparation. The surrogate standard recovery is used to monitor matrix effects and losses during sample preparation. Surrogate standard control criteria are applied to all analytical and QC check samples, and if surrogate criteria are not met, re-extraction and re-analysis may be performed.

### **7.1.5 Internal Standards**

Some organic compound analyses include the addition, quantitation, and recovery calculation of internal standards. Internal standards are usually synthetic compounds that are similar in chemical behavior to the target analytes. They are added to sample extracts at the time of instrument analysis and are used to quantify results through internal standard calibration procedures. Internal standard recoveries are used to correct for injection and detector variability. Gas chromatography (GC)/mass spectrometry must use internal standards and have acceptability limits for internal standard areas. Use of internal standard quantitation for GC methods is optional.

### **7.1.6 Method Blanks**

A method blank is used to monitor the laboratory preparation and analysis systems for interferences and contamination from glassware, reagents, sample manipulations, and the general laboratory environment.

The method blank must not contain analytes at concentrations greater than the required quantitation limits. If contaminants are found that either contribute to the apparent concentration of a particular target analyte or interfere with the analysis, the analysis sequence must be stopped, the source of contamination identified and corrected, and the analysis must be repeated. Contamination in the method blank could mean that the entire associated batch of extracts or digestates must be reprepared. Therefore, it is very important to make sure that no such contamination is present.

A method blank is carried through the entire sample preparation process and is included with each batch of samples. Some methods of inorganic analysis do not have a distinctive preparation step. For these tests, the instrument blank, which contains all reagents used with samples, is considered to be the method blank.

### **7.1.7 Instrument Blanks**

An instrument blank is used to monitor the cleanliness of the instrument portion of a sample analysis process.

Instrument blanks must be analyzed following calibration runs, before sample analyses are initiated, and after analysis of samples that contain high concentrations of analytes or potentially interfering materials. The instrument blanks must not contain target analytes at concentrations greater than the required reporting limits. If the laboratory consistently observes contaminants in the instrument blanks, the source of the contamination must be investigated and eliminated, if possible.

Instrument blanks are usually just the solvent or acid solution of the standard used to calibrate the instrument. During metals analyses one instrument blank is usually analyzed for every 10 samples.

### **7.1.8 Post-Digestion Spikes and the Method of Standard Addition**

A post-digestion spike is used during metal analysis to assess analytical interferences that may be caused by general matrix effects or high concentrations of analytes present in the sample. A digested sample is spiked with the analyte of interest at a known concentration, and the spike recovery is used to estimate the presence and magnitude of interferences.

If a post-digestion spike recovery fails to meet acceptance criteria, the method standard addition (MSA) will be used to quantitate the sample result. The MSA technique compensates for a sample constituent that enhances or depresses the analyte signal. To perform the MSA, known amounts of a standard at different concentrations are added to two to three aliquots of digested sample, and each spiked sample and the original unspiked sample are analyzed. The absorbance is then plotted against the concentration, and the resulting line is extrapolated to zero absorbance. The point of interception with the concentration axis is the indigenous concentration of the analyte in the sample.

## **7.2 Project-Required Reporting Limits**

According to the Navy requirements, (NFESC, 1999), the laboratory will determine the method detection limits (MDLs) for each method, instrument, analyte, and matrix by using the procedure described in 40 Code of Federal Regulations (CFR) Part 136B. The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99-percent confidence that the analyte concentration is greater than zero.

An MDL study involves preparation/digestion and analysis of seven replicates of a given matrix spiked with target analytes at concentrations two to five times greater than the estimated MDL. At a minimum, the laboratory will conduct annual MDL studies. The laboratory will select the practical quantitation limits (PQLs) for all analytes at concentration levels that exceed the calculated MDLs by a factor of 2 to 10.

Reporting limits for the project are presented in Table 2-1. These limits may be elevated for individual samples if matrix interferences are encountered. Precision and accuracy QC limits for each method and matrix are identified in Table 2-2.

## **8.0 Laboratory Quality Assurance**

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This section describes analytical QC procedures, including laboratory qualifications, QA program, and QC procedures associated with analytical methods.

### **8.1 Laboratory Qualifications**

The analytical laboratories selected to analyze samples for this project will be certified by the California Department of Health Services (DHS) through the Environmental Laboratory Accreditation Program (ELAP) for all the analytical methods required for the project. In addition, each laboratory will successfully complete the NFESC Laboratory Evaluation Program before sampling activities and maintain that status throughout the project.

Laboratories selected for the project must be capable of providing the required turnaround times, project QC, and data deliverables required by this SAP.

### **8.2 Calibration**

All instruments will be calibrated and the calibration acceptance criteria met before samples are analyzed. Calibration standards will be prepared with National Institute for Standards and Testing (NIST)-traceable standards and analyzed according to method requirements. Initial calibration acceptance criteria documented in the laboratory SOPs will meet those of applicable guidance documents. The initial calibration will meet one of the following requirements:

- The lowest concentration of the calibration standard is less than or equal to the PQL based on the final volume of extract or sample.
- For each target analyte, at least one of the calibration standards will be at or below the regulatory limit (action level) as defined by the DQOs.

Before samples are analyzed, initial calibration will be verified with a second source standard prepared at the mid-point of the calibration curve. Initial calibration verification will meet the acceptance criteria that are expressed in the laboratory SOPs.

Daily calibration verification will be conducted at the method-prescribed frequencies and will meet the acceptance criteria of applicable guidance documents. Daily calibration verification will not be used for quantitation of target analytes.

Calibration data (calibration tables, chromatograms, instrument printouts, and laboratory logbooks) will be clearly labeled to identify the source and preparation of the calibration standard, and, will therefore be traceable to the standard preparation records.

Calibration requirements and acceptance criteria for organic and inorganic analysis are summarized in Table 8-1.

### **8.3 Preventive Maintenance**

The primary objective of a preventive maintenance program is to help ensure the timely and effective completion of a measurement effort by minimizing the downtime of crucial analytical equipment caused by expected or unexpected component failure. In implementing this program, efforts are focused in three primary areas: maintenance responsibilities, maintenance schedules, and adequate inventory of critical spare parts and equipment.

Maintenance responsibilities for laboratory equipment are assigned to the respective laboratory managers. The laboratory managers then establish maintenance procedures and schedules for each major equipment item. These are contained in the maintenance logbooks assigned to each instrument.

The effectiveness of any maintenance program depends, to a large extent, on adherence to specific routine maintenance for each major equipment item. Other maintenance activities may also be identified as requiring attention on an as-needed basis. The manufacturer's recommendations or sample throughput provide the basis for the established maintenance schedules, and the service contracts of the manufacturer provides primary maintenance for many major instruments (e.g., inductively coupled plasma (ICP) instruments, atomic absorption spectrometers, analytical balances, etc.). Maintenance activities for each instrument are documented in a maintenance log.

Along with a schedule for maintenance activities, an adequate inventory of spare parts is required to minimize equipment downtime. This inventory emphasizes those parts (and supplies) that are subject to frequent failure, have limited useful lifetimes, or cannot be obtained in a timely manner should failure occur.

The respective laboratory managers are responsible for maintaining an adequate inventory of necessary spare parts. Sufficient equipment is on hand to continue analyses in the event that an instrument encounters problems. In addition to backup instrumentation, a supply of spare parts, such as fittings, septa; atomic absorption lamps, mirrors, diaphragms; graphite furnace tubes; and other ancillary equipment, is maintained.

## **8.4 Training**

The laboratory will have an established policy and procedure on training and documenting of the analyst's competency. Each staff member that performs sample preparation and analysis will demonstrate their proficiency through preparation and analysis of four LCSs as described in SW-846. An analyst will be considered proficient if the acceptance criteria for method accuracy and precision are met. The laboratory will maintain all training records on file.

## **8.5 Supplies and Consumables**

The laboratory will inspect supplies and consumables before their use in analysis. The materials specifications in the analytical methods will be used as a guideline for establishing the acceptance criteria for these materials. Purity of reagents will be monitored by analysis of method blanks. An inventory and storage system for materials and supplies will ensure use before manufacturers' expiration dates and storage under safe and chemically compatible conditions.

## **8.6 Software Quality Assurance**

The generation, compilation, and reporting of electronic data are critical components of laboratory operations. The laboratory, to produce defensible data of known quality, will develop a software QA plan or an SOP that will describe activities related to data generation, reduction, and transfer with modern tools of data acquisition, as well as the policies and procedures for procurement, modification, and use of computer software.

### **8.6.1 Software Validation**

The laboratory will have procedures in place to ensure that all software for data reduction, reporting, and transfer adequately and correctly performs all intended functions and does not perform any unintended functions.

The laboratory will verify, validate, and document the proper functioning of the software immediately after any new data acquisition or management systems have been installed at the laboratory. The baseline verification and validation may include the following actions:

- Comparison of the computer printouts with reduced data and the raw data
- Manual calculations to confirm correctness of all computer calculations
- Comparison of analytical report to the electronic deliverable files.

Baseline software validation will be documented in laboratory QA files. Continuing software verification will take place during sample analysis. The correctness of results will be checked by

one manual calculation per QC batch during data review to eliminate data entry errors during analytical sequence setup, as part of data package review. This verification will be documented in the QA/QC checklist for each data file.

### **8.6.2 Software Security**

Only authorized and trained laboratory personnel will have access to the operating and data management software. Each analyst will be trained in software use for operating different functional areas of the software systems and will have a password that allows access to these areas.

### **8.6.3 Manual Integration**

Manual integration is sometimes necessary for proper compound quantitation in cases of overlapping or tailing peaks and sloping baselines. When justified, manual integration can be conducted for standards, samples, and QC check samples.

Manual integration may include valley-to-valley baselines, vertical peak separation or slope integration.

If a need for manual integration arises, the analysts performing analysis will select a proper approach based on their professional judgment. Manual integration then will be conducted and documented in the data file. Once an approach has been selected, it will be consistently used for the similarly affected peaks.

Manual integration documentation will include a copy of a computer-integrated chromatogram, a copy of a manually integrated chromatogram, a brief justification description, and the name of the person who performed the manual integration. The laboratory manager will review and approve all manual integrations performed by analysts.

## 9.0 Laboratory Corrective Action

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Corrective action will be implemented by the laboratory when a circumstance or procedural error is detected that has a negative impact on the quality of the analytical data generated during sample analysis. Awareness of a problem must exist for a corrective action to be initiated. In most instances, the individuals performing laboratory analyses are in the best position to recognize problems that will affect data quality. Keen awareness on their part can frequently detect minor instrument changes, drifts, or malfunctions that can then be corrected, thus, preventing a major breakdown in the QA system in place. If major problems arise, laboratory personnel are in the best position to recommend the proper corrective action and initiate it immediately, thus, minimizing data loss. Therefore, the laboratory personnel will have the prime responsibility for recognizing a nonconformance and the need for implementing and documenting the corrective action.

The following closed-loop corrective action process will be used if a situation arises requiring corrective action:

1. Define the problem.
2. Assign responsibility for investigating the problem.
3. Investigate and determine the cause of the problem.
4. Determine corrective action course to eliminate the problem.
5. Assign responsibility for implementing the corrective action.
6. Determine the effectiveness of the corrective action and implement the correction.
7. Verify that the corrective action has eliminated the problem.
8. If not completely successful, return to Step 1.

The personnel identifying or originating a nonconformance will document it to include the following:

- Identify the individual discovering or originating the nonconformance.
- Describe the nonconformance.
- Obtain required approval signatures.
- Identify method for corrective action or describe the variance granted.
- Prepare a schedule for completing corrective action.

All affected project samples will be listed on the nonconformance/corrective action report. The laboratory project manager will notify the IT project chemist of any laboratory nonconformance

affecting the samples. Nonconformance/corrective action reports will be submitted to IT as part of data packages. Corrective action procedures for metal analysis are presented in Table 8-1.

## **9.1 Batch Corrective Action**

Analytical laboratory processes are batch processes, and the batch is a basic unit for the frequency of some quality control elements. A batch is a group of samples of similar matrix that behave similarly relative to the procedures being employed. The following three types of batches can be identified at the analytical laboratory:

- Preparation batch
- Instrument batch
- Sample delivery group (SDG).

A preparation batch is a group of up to 20 field samples that are prepared (e.g., extracted or digested) simultaneously or sequentially without interruption. Samples in each batch are of similar matrix (e.g., liquid waste, water), are treated in a similar manner, and are processed with the same lots of reagents. For inorganic compound analyses, each batch will contain a method blank, an LCS, an MS, and a sample duplicate. These QC check samples are not counted into the maximum batch size of 20.

An instrument batch is a group of samples that are analyzed within the same analytical run sequence. If the continuous operation of an instrument is interrupted (shut down for maintenance, etc.), a new instrument batch must be started. The instrument batch includes an instrument blank, calibration check standards, extracts/digestates of the field samples, and QC check samples. The number of samples in the analytical batch is not limited, but the frequency of the calibration check standard and instrument blank analysis is mandated in each particular method.

Method QC acceptance criteria determine whether a method is performing within acceptable limits of precision and accuracy. There is a method component and a “matrix” component to this determination. The method component measures the performance of the laboratory analytical processes during the sample analyses. The matrix component measures the method performance on a specific matrix. Some QC elements uniquely measure the laboratory component of method performance, but all QC elements measuring the matrix component contain the method component.

Method blanks and laboratory control samples uniquely measure the method performance. Matrix spikes, matrix spike duplicates, laboratory sample duplicates, and postdigestion spikes measure the matrix component of method performance.

A sample delivery group is a group of samples received collectively by the laboratory on the same day and which will be assigned the same unique laboratory project number.

## **9.2 Method Blank**

The method blank measures laboratory-introduced contamination for the sample batch, which is a group of samples that undergoes the same preparation procedure at the same time along with a method blank. Batch corrective action is initiated when contamination is found. Although it is the goal to have no detected target analytes in the method blanks, analytes may be periodically detected in blanks because of the nature of the analysis or the reporting limit for the analyte.

If the following conditions are met, a method blank will be considered acceptable:

- Target analytes are present at concentrations less than one half of the PQLs.
- Target analytes are present at concentrations less than 5 percent of the regulatory limits for these analytes.
- Target analytes are present at concentrations less than 5 percent of the sample results for these analytes.

If the method blank results do not meet these acceptance criteria, the laboratory will initiate corrective action.

The first step of corrective action is to assess the effect on the samples. For example, if an analyte is found only in the blank, but not in any of the associated samples, or if the target analyte in the blank is less than 1/20 the value in the sample, no corrective action is necessary.

If corrective action is required, the method blank and any samples containing the same contaminant will be reanalyzed. If the contamination remains, the contaminated samples of the batch would be re-extracted and reanalyzed with a new method blank and QC check samples.

## **9.3 Laboratory Control Sample**

An LCS must meet the accuracy acceptance criteria for target analytes for the batch to be considered acceptable. If the target analytes are outside of the acceptance limits, corrective action will be initiated. Corrective action will include re-extraction and reanalysis of the whole batch, including method blank, samples, and QC check samples.

If matrix spikes are not conducted, an LCS/LCD pair will be analyzed with each batch of samples. If the LCS/LCD are outside method acceptance criteria for accuracy and precision, the whole batch will be re-extracted and reanalyzed, including method blank, samples, and QC check samples.

## **9.4 Matrix Spikes**

An MS/MSD pair is included with each batch of samples for organic compound analyses, and MS and laboratory sample duplicates are included with each batch of samples for inorganic compound analysis. These QC check samples allow evaluating the accuracy and precision of analysis and the influence of matrix effects.

Matrix spike data evaluation is more complex than blank or LCS data evaluation since matrix spikes measure matrix effects in addition to sample preparation and analysis effects. Sample heterogeneity and presence of interfering chemical compounds often negatively affect accuracy and precision of analysis. If the native concentration of target analytes in the sample chosen for spiking is high relative to the spiking concentration, the differences in the native concentration between the unspiked sample and the spiked sample may contribute a significant error in the precision and accuracy. The accuracy and precision in this case are not representative of the true method and matrix performance.

If the accuracy of MS/MSD analysis is outside the acceptability limits for any target analyte, the LCS will be evaluated. If the LCS accuracy limits are met, the MS/MSD recovery problem will be identified as matrix effect and no further action will be required. If the LCS accuracy limits are not met, corrective action will be implemented and the affected samples and associated QC samples will be reprepared and reanalyzed.

If the MS/MSD or sample/sample duplicate pair fails in precision because of observed matrix interferences, sample variability, or the nature of the contaminant, corrective action will not be required, and the laboratory will make an appropriate notation in the case narrative.

### **9.4.1 Individual Sample Corrective Action**

In addition to batch corrective action, individual samples within a batch may also require corrective action. Re-extraction and reanalysis of individual samples will take place if errors have been made during sample preparation, and results of analysis are not conclusive.

## **10.0 Data Management**

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This section describes the data management procedures for data review, verification, reporting and validation.

### **10.1 Data Reduction, Verification, and Reporting**

All analytical data generated by the laboratory in support of the Environmental Field Activity--West (EFA--West) Environmental RAC projects will be reviewed before reporting to ensure the validity of reported data. This internal laboratory data review process will consist of data reduction, three levels of documented review, and reporting. Review processes will be documented using appropriate checklist forms or logbooks, which will be signed and dated by the reviewer.

#### **10.1.1 Data Reduction**

Data reduction involves the mathematical or statistical calculations used by the laboratory to convert raw data to the reported data. Reduction of analytical data will be performed by the laboratory as specified in each of the appropriate analytical methods and laboratory SOPs. For each method, all raw data results will be recorded using method-specific forms or a standardized output from each of the various instruments.

All data calculations will be verified and initialed by personnel both generating and approving the calculations. All raw and electronic data, notebook references, supporting documentation, and correspondence will be assembled, packaged, and stored for a minimum of 10 years for future use. All reports will be held to ensure strict client confidentiality. If the laboratory is unable to store project-related data for 10 years, then it is the responsibility of the laboratory to contact IT to make alternative arrangements.

#### **10.1.2 Laboratory Data Verification and Review**

The laboratory analyst who generates the analytical data will have the primary responsibility for the correctness and completeness of data. Each step of this verification and review process will involve the evaluation of data quality based on both the results of the QC data and the professional judgment of those conducting the review. This application of technical knowledge and experience to the evaluation of data is essential in ensuring that data of known quality are generated consistently. All data generated and reduced will follow well-documented in-house protocols.

**Level 1. Technical (Peer) Data Review.** Peer analysts will review the quality of their work based on an established set of guidelines, including the QC criteria established in each method, in this QC plan, and as stated within the laboratory QA manual. This review will, at a minimum, ensure that the following conditions have been met:

- Sample preparation information is correct and complete.
- Analysis information is correct and complete.
- Appropriate SOPs have been followed.
- Calculations are verified.
- There are no data transposition errors.
- Analytical results are correct and complete.
- QC samples are within established control limits.
- Blanks and laboratory control samples are within appropriate QC limits.
- Special sample preparation and analytical requirements have been met.
- Documentation is complete, for example, any anomalies and holding times have been documented and forms have been completed.

**Level 2. Technical Data Review.** This review will be performed by a supervisor or data review specialist whose function is to provide an independent review of data packages. This review will also be conducted according to an established set of guidelines and will be structured to verify the following finding of Level 1 data review:

- All appropriate laboratory SOPs have been followed.
- Calibration data are scientifically sound, appropriate to the method, and completely documented.
- QC samples are within established guidelines.
- Qualitative identification of contaminants is correct.
- Manual integrations are justified and properly documented.
- Quantitative results and calculations are correct.
- Data are qualified correctly.
- Documentation is complete; for example, any anomalies and holding times have been documented and appropriate forms have been completed.

- Data is ready for incorporation into the final report.
- The data package is complete and is in compliance with contract requirements.

The Level 2 review will be structured so that all calibration data and QC sample results are reviewed and all of the analytical results from at least 10 percent of the samples are checked back to the sample preparation and analytical bench sheets. If no problems are found with the data package, the review will be considered complete.

If any problems are found with the data package, an additional 10 percent of the sample results will be checked back to the sample preparatory and analytical bench sheets. This cycle will then be repeated until either no errors are found in the data set checked or until all data have been checked. All errors and corrections noted will be documented.

**Level 3. Administrative Quality Assurance Data Review.** The laboratory QA manager will review 10 percent of all data packages. This review should be similar to the review as provided in Level 2 except that it will provide a total overview of the data package to ensure its consistency and compliance with project requirements. All errors noted will be corrected and documented.

### **10.1.3 Data Reporting**

This section details the requirements for data reporting and data package formats that will be provided by the laboratory.

**Hard Copy Deliverables.** All relevant raw data and documentation, including (but not limited to) logbooks, data sheets, electronic files, and final reports will be maintained by the laboratory for at least 7 years. The laboratory will notify IT 30 days before disposal of any relevant laboratory records.

IT will maintain copies of all chain-of-custody forms until receipt of the laboratory report. Laboratory reports will be logged in upon receipt and filed in chronological order. The second copy of the report will be sent for third-party data validation.

Data packages will be prepared to meet the requirements for data package contents, which are presented in Table 10-1 through Table 10-4. Data packages for waste characterization samples will require a standard laboratory package.

#### **10.1.4 Electronic Data Deliverables**

The electronic data deliverable (EDD) will be in the ITEMST<sup>TM</sup> format. The analytical laboratory will follow the requirements stated in the Laboratory Interface Document for the Analytical Laboratory Electronic Data Deliverable.

The electronic data for analytical results and survey data will also be supplied to IT in a format consistent with the requirements of the SWRCB for upload into Geotracker.

At project closeout, IT will submit a Navy Electronic Data Transfer System (NEDTS)-compatible electronic file to the Navy.

The laboratory will certify that the EDD and the hard copy reports are identical. Both the EDD and the hard copy reports will present results for two or three significant figures. For inorganic results, two significant figures will be used for results that are less than 10, and three significant figures will be used for results that are greater than 10. The EDD for each sample delivery group will be due at the same time as the hard copy (i.e., 14 days after the last sample of the sample delivery group has been delivered to the laboratory).

Field information (date and time collected, sample identification, etc.) will be entered directly into the main database from the chain-of-custody form or uploaded from electronic files generated in the field.

#### **10.2 Data Validation**

According to the Navy (SWDIV, 2001a), data will be validated by an independent validation company. The data will be validated at 90-percent Level III and 10-percent Level IV. The data that will be used for waste disposal purpose do not require data validation by an independent data validation company. This data will also be reviewed by an IT project chemist.

The validation will be according to the guidelines of the EPA CLP *National Functional Guidelines for Inorganic Data Review* (EPA, 1994), and the QC criteria specified in this document. Data will be validated and flagged with the following data qualifiers:

- *J qualifier* means that the analyte was positively identified, the quantitation is an estimation. The analyte was positively identified but the associated numerical value is an estimated value above the MDL and below the reporting limit (RL).
- *U qualifier* means that the analyte was analyzed for, but not detected. The associated numerical value is at or below the RL.

- *R qualifier* means that the data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.

### **10.3 Data Quality Assessment Report**

The project chemist will determine if the project DQOs have been met based on data validation and review, and will calculate data completeness. The project chemist will prepare a data quality assessment report (DQAR) to reconcile the collected data with project DQOs and to establish and document data usability. The DQAR will discuss the following topics:

- Implementation of sampling design and analysis according to the approved SAP (or sample completeness and representativeness)
- Proper frequency of field QC samples and the adequacy of field decontamination procedures
- Accuracy and precision of the data collected
- Data comparability, if appropriate
- Data usability for project decisions.

The DQAR will be included in the final project report.

## **11.0 Quality Assurance Oversight**

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The QA oversight for this project will include system audits of field activities and of the laboratory subcontracted by the Navy to perform the analysis.

### **11.1 Laboratory Assessment and Oversight**

Systems and performance audits will be carried out by IT as independent assessments of sample collection and analysis procedures. The systems audit is a qualitative review of the overall sampling or measurement system, while the performance audit is a quantitative assessment of a measurement system.

Audit results are used to evaluate if the analytical laboratories are able to produce data that fulfill the objectives established for the program and to identify any areas requiring corrective action.

#### **11.1.1 Navy Laboratory Audits**

The laboratories will successfully complete an NFESC laboratory audit. An NFESC audit conducted in the past for a different project is an acceptable qualification, provided it is still current.

#### **11.1.2 Technical Systems Audits**

A technical systems audit is an on-site, qualitative review of the sampling or analytical system to ensure that the activity is being performed in compliance with the SAP specifications and that the collected data fulfill the project DQOs.

Laboratories performing under this program may be required to have a prequalification (or periodic) systems audit performed by IT, depending on the scope of services to be provided, past performance, or other factors indicating a need to evaluate quality in this manner. Subsequently, the laboratories will respond to and address any project or technical concerns resulting from the audits. A follow-up audit may be performed to verify resolution of findings and observations as well as review the corrective measures taken. Laboratories found deficient will not be used on a project until the deficiencies are corrected and the laboratory accepted. Laboratories previously qualified for the types of testing to be performed on the project will not require prequalification provided that prequalification has been within the past year and the work performed has been acceptable.

The laboratory systems audit results will be used to review laboratory operations and to ensure that any outstanding corrective actions have been addressed. A laboratory systems audit will include the following critical areas:

- Sample custody procedures
- Calibration procedures and documentation
- Completeness of data forms, notebooks, and other reporting requirements
- Data review procedures
- Storage, filing, and record keeping procedures
- QC procedures and documentation
- Operating conditions of facilities and equipment
- Documentation of training and maintenance activities
- Systems and operations overview
- Security of laboratory automated systems.

After the audit, a debriefing session will be held for all participants to discuss the preliminary audit results. The auditor will then complete the audit evaluation and submit to the project manager and the laboratory an audit report including observations of the deficiencies and the necessary recommendations for corrective actions. Follow-up audits will be performed before completion of the project to ensure corrective actions have been taken.

### **11.1.3 Performance Evaluation Audits**

Performance audits quantitatively assess the data produced by a measurement system. A performance audit involves submitting project-specific performance evaluation (PE) samples for analysis for each analytical method used in the project. The performance audit answers questions about whether the measurement system is operating within control limits and whether the data produced will meet the project DQOs. If there is a concern about the laboratory performance, or per the Navy request, IT will administer performance evaluation samples for the target analytes.

Review of PE results include the following elements:

1. Correct identification and quantitation of the PE sample analytes.
2. Accurate and complete reporting of the results.
3. Measurement system operation within established acceptance limits for accuracy.

The concentrations reported for the PE samples will be compared with the known or expected concentrations spiked in the samples. The percent recovery will be calculated and the results assessed according to the acceptance limits, which are based on inter-laboratory studies. If the

accuracy criteria are not met, the cause of the discrepancy will be investigated and a second PE sample will be submitted. PE sample results review will be documented in a report to the project manager.

#### **11.1.3.1 Performance Evaluation Sample Programs**

The off-site laboratory will participate in the EPA PE Water Supply and Water Pollution Studies program or equivalent program for state certifications. Satisfactory performance in these PE programs also demonstrates proficiency in methods used to analyze project samples. The laboratory will document the corrective actions to unacceptable PE results to demonstrate resolution of the problems.

#### **11.1.4 Magnetic Tape Audits**

Magnetic tape audits involve the examination of the electronic media used in the analytical laboratory to acquire, report, and store data. These audits are used to assess the authenticity of the data generated and assess the implementation of good automated laboratory practices. IT may perform magnetic tape audits of the off-site laboratory when warranted by project PE samples results, or by other circumstances.

### **11.2 Field Audits**

The IT and the Navy QA Officers may schedule audits of field activities at any time to evaluate the execution of sample collection, identification, and control in the field. The audit may also include observations of chain-of-custody procedures, field documentation, instrument calibrations, and field measurements.

Field documents and chain-of-custody forms will be reviewed to ensure that all entries are printed or written in indelible ink, dated, and signed.

Sampling operations will be reviewed and compared with the SAP, and other applicable SOPs. The auditor will verify that the proper sample containers are used, the preservatives are added or are already present in the container, and the documentation of the sampling operation is adequate.

Field measurements will be reviewed by random spot-checking to determine that the instrument is within calibration, that the calibration is completed at the appropriate frequency, and that the sensitivity range of the instrument is appropriate for the project.

Audit findings will be documented in a report to the IT program QC manager and the project manager. Corrective action will be implemented as needed.

### **11.3 *Quality Assurance Project Plan Revision or Amendment***

When circumstances arise that impact the original project DQOs, such as a significant change in work scope, the SAP document will be revised or amended. The modification process will be based on EPA guidelines and direction from the Navy.

## 12.0 References

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California Code of Regulations *Title 22, Division 4, Chapter 15, Article 4, § 64431, Table 64431-A.*

California Code of Regulations *Title 22, Division 4, Chapter 15, Article 5.5, § 64444, Table 64444-A.*

California Code of Regulations *Title 22, Division 4, Chapter 15, Article 16, § 64449, Table 64449-A and Table 64449-B.*

California Code of Regulations *Title 22, Division 4, Chapter 17.5, Article 1, § 64672.3.*

California Code of Regulations *Title 22, Division 4.5, Chapter 11, Article 3, § 66261.24,*  
Barclays California Code of Regulations, Register 91, No. 40, October 4, 1991.

CCR, see California Code of Regulations.

EPA, see U.S. Environmental Protection Agency.

IT, see IT Corporation.

IT Corporation, August 2000, *IT Standard Quality Procedures and Standard Operating Procedures Manual.*

Naval Facilities Engineering Service Center, 1999, *Navy Installation Restoration Chemical Data Quality Manual.*

U.S. Army Corps of Engineers, 1994, *Requirements for the Preparation of Sampling and Analysis Plan.*

U.S. Environmental Protection Agency, 1994, *National Functional Guidelines for Inorganic Data Review.*

U.S. Environmental Protection Agency, 1996, *Test Methods for Evaluating Solid Waste, SW-846, Physical/Chemical Methods, Update III, September.*

U.S. Environmental Protection Agency, 2000, *Guidance for the Data Quality Objectives Process EPA QA/G-4.*

U.S. Environmental Protection Agency, 2001, *Requirements for QAPPs, EPA QA/R-5.*

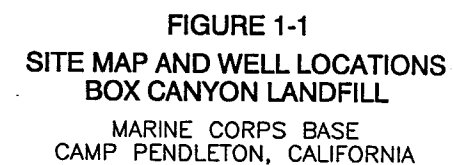
U.S. Navy Southwest Division, October 2001a, *Environmental Work Instruction 3EN2.1—Chemical Data Validation.*

IT Corporation, 2002, *Groundwater Quality Baseline Sampling and Analysis Plan, IR Site 7, Box Canyon Landfill, Marine Corps Base Camp Pendleton, California, Revision 0, October 3.*

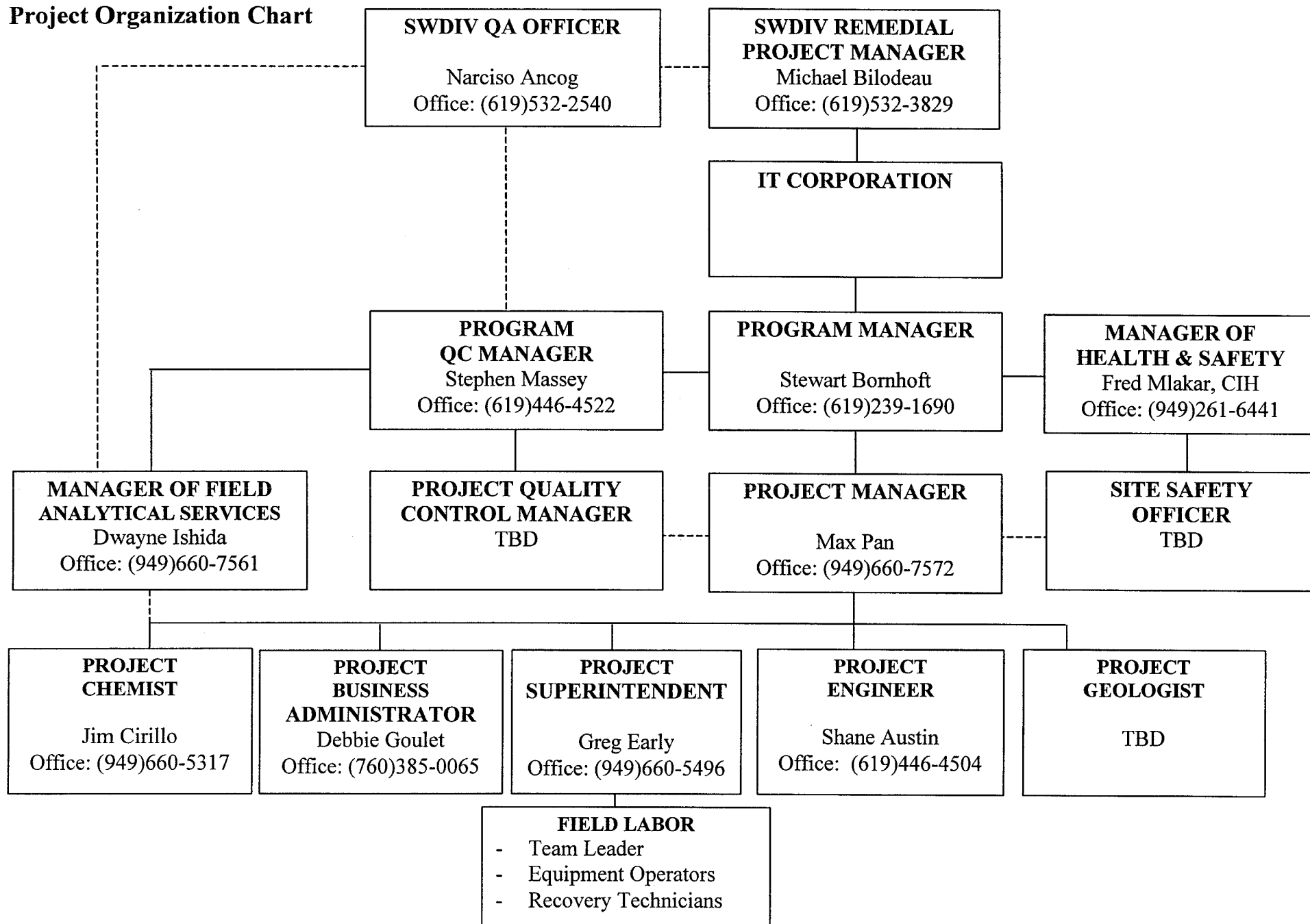
U.S. Navy Southwest Division, October 2001b, *Environmental Work Instruction 3EN2.2—Review, Approval, Revision, and Amendment of Field Sampling Plans and Quality Assurance Project Plans*.

U.S. Navy Southwest Division, October 2001c, *Environmental Work Instruction 3EN2.3—Laboratory Quality Assurance Program*.

## FIGURES



**Figure 1-2**  
**Project Organization Chart**



### Figure 6-1 Chain-of-Custody Record

		<b>IT Corporation</b> 2790 Mosside Blvd. Monroeville, PA 15146-2792 (412)372-7701		<b>CHAIN-OF-CUSTODY RECORD</b>		LABORATORY COPY <b>A 14639</b> <small>FORM 0019 REV. 9-99</small>						
IT'S LAB COORDINATOR		LAB COORDINATOR'S PHONE		LAB COORDINATOR'S FAX		LABORATORY SERVICE ID		LABORATORY CONTACT		MAIL REPORT (COMPANY NAME)		
PROJECT NAME:		PROJECT LOCATION		PROJECT NUMBER		LABORATORY PHONE		LABORATORY FAX		RECIPIENT NAME		
PROJECT CONTACT		PROJECT PHONE NUMBER		PROJECT FAX		LABORATORY ADDRESS		ADDRESS				
PROJECT ADDRESS		CITY, STATE AND ZIP CODE		CLIENT		CITY, STATE AND ZIP CODE		CITY, STATE AND ZIP CODE				
PROJECT MANAGER		PROJECT MANAGER'S PHONE		PROJECT MANAGER'S FAX		<div style="display: flex; align-items: center; justify-content: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Analyses</div> <div style="border: 1px solid black; width: 100px; height: 100px; margin: 0 auto;"></div> </div>						
Item	Sample Identifier	Matrix	Date	Time	Preserved	# of Cont.	QC Level	T.A.T.	Comments			
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
SAMPLES COLLECTED BY:		COURIER AND AIR BILL NUMBER:				COOLER TEMPERATURE UPON RECEIPT:						
RELINQUISHED BY		RECEIVED BY		DATE	TIME	SAMPLE'S CONDITION UPON RECEIPT						

Distribution: White - Laboratory (To be returned with Analytical Report); Goldenrod - Project File; Manilla - Project Data Manager

**Figure 6-2**  
**Custody Seal**

<p style="text-align: center;"><b>CUSTODY SEAL</b></p> <p style="text-align: center;"><b>Date:</b> _____</p> <p style="text-align: center;"><b>Signature:</b> _____</p>
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## TABLES

**Table 1-1  
Project-Required Groundwater Monitoring Network Summary**

Well No.	Well Construction (feet)				Screen Location (ft bgs)		Screen Location (ft msl)		GW Level (msl ft)		Hydrogeologic Unit*
	Ground Level (msl)*	Well Depth*	Measured Depth**	Material	top*	bottom*	top*	bottom*	04/20/94	04/15/02	
7W-01A	192.84	184.00	176.35	4" pvc/ss	162.00	182.00	30.84	10.84	45.03	NM	TsoL
7W-01B	192.75	209.00	210.36	4" ss	191.50	206.50	1.25	-13.75	45.09	NM	TsoL
7W-02A	173.51	151.00	153.02	4" ss	139.50	149.50	34.01	24.01	43.18	51.31	TsoL
7W-02B	173.18	228.00	216.90	4" ss	192.50	212.50	-19.32	-39.32	44.03	52.37	TsoL
7W-03A	224.71	159.00	159.68	4" pvc/ss	136.00	156.00	88.71	68.71	82.46	95.38	Tsga
7W-03B	224.45	222.00	179.16	4" ss	195.00	220.00	29.45	4.45	82.65	95.4	Tsga
7W-04A	164.99	151.00	(no well casing)	4" ss	138.00	148.00	26.99	16.99	30.20	NM	TsoL
7W-04B	164.66	200.00	204.99	4" ss	178.50	198.50	-13.84	-33.84	30.41	36.88	TsoL
7W-05A	176.02	152.00	153.29	4" ss	139.00	149.00	37.02	27.02	36.87	45.05	TsoL
7W-05B	175.74	225.00	218.46	4" ss	194.00	214.00	-18.26	-38.26	37.46	45.53	TsoL
7W-06A	163.57	149.00	138.35	4" ss	125.00	145.00	38.57	18.57	28.56	32.15	Tsga
7W-06B	161.88	229.00	229.08	4" ss	208.00	228.00	-46.12	-66.12	28.58	32.15	Tsga
7W-07	18.02	50	NM	4" ss	14.00	34.00	4.02	-15.98	4.43	NM	Qal??
7W-08A	18.49	38	NM	4" ss	15.00	35.00	3.49	-16.51	7.98	NM	Qal??
7W-08B	18.31	66	NM	4" ss	50.00	65.00	-31.69	-46.69	8.03	NM	Qal??
7W-08C	18.45	117	NM	4" ss	95.00	110.00	-76.55	-91.55	8.05	NM	Qal?? (clay lens)??
7W-09A	18.84	35	NM	4" ss	10.00	30.00	8.84	-11.16	6.32	NM	Qal??
7W-09B	18.77	109	NM	4" ss	88.00	108.00	-69.23	-89.23	9.78	NM	Qal??
MW-01	31.12	30.00	31.95	2" pvc	10.00	30.00	21.12	1.12	23.11	12.68	Qal??
7W-11B	28.69	70.00	68.85	4" ss	45	65	-16.31	-36.31	20.91	12.66	Qal?? (clay lens)??
7W-11C	28.40	118.00	121.89	4" ss	95.00	115.00	-66.60	-86.60	19.83	12.59	Qal??(clay lens)??
MW-02	37	43	NM	2" pvc	23.00	43.00	14.00	-6.00	25.04	NM	Qal??
MW-03	190	260	NM	4" pvc	170.00	210.00	20.00	-20.00	47.17	Abandoned in 1999	TsoL

\*Well dimensions and hydrogeologic units are based on RI boring logs.

TsoU: Tertiary San Onofre Breccia Upper Unit

TsoL: Tertiary San Onofre Breccia Lower Unit

Tsga: Tertiary Sand and Gravel Alluvium

Qal: Quaternary Alluvium

\*\*Measured depth based on actual sounding with probe from TOWC.

ft bgs ft - feet below ground surface

ft msl ft - feet mean sea level

pvc - polyvinyl chloride

pvc/ss - PVC well casing and ss screen

ss - stainless steel well casing and screen

TOWC - Top of well casing

**Table 1-2**  
**Project Personnel and Chemical Data Collection Responsibilities**

Position	Responsibility
U.S. Navy QAO	<ul style="list-style-type: none"> <li>• Provides governmental oversight of the IT QA Program.</li> <li>• Provides quality-related directives through Contracting Officer's Technical Representative.</li> <li>• Provides technical and administrative oversight of IT surveillance audit activities.</li> <li>• Acts as point of contact for all matters concerning QA and the Navy's Laboratory QA Program.</li> <li>• Prepares governmental budget estimates for all QA functions included in IT contracts.</li> <li>• Coordinates training on matters pertaining to generation and maintenance of quality of data.</li> <li>• Authorized to suspend project execution if QA requirements are not adequately followed.</li> </ul>
Program Chemist	<ul style="list-style-type: none"> <li>• Reviews and approves the SAP.</li> <li>• Guides the selection of subcontract analytical laboratories.</li> <li>• Conducts field and laboratory audits.</li> <li>• Serves as a point of contact for the U.S. Navy QAO.</li> <li>• Develops corrective action, as required.</li> <li>• Serves as a technical advisor to the project.</li> </ul>
Project Chemist	<ul style="list-style-type: none"> <li>• Develops the project DQOs and prepares the SAP.</li> <li>• Selects qualified subcontract laboratories.</li> <li>• Implements chemical data QC procedures and performs auditing of field performance.</li> <li>• Reviews laboratory data before use.</li> <li>• Coordinates data validation of laboratory data.</li> <li>• Reviews data validation report.</li> <li>• Prepares the appropriate sections of the report summarizing the project activities.</li> </ul>
Field Technician	<ul style="list-style-type: none"> <li>• Performs all sampling in accordance with approved SAP.</li> <li>• Ensures that field QC samples are collected as specified in the SAP.</li> <li>• Completes field documentation.</li> <li>• Coordinates laboratory and field sampling activities.</li> <li>• Implements field corrective actions, as required.</li> </ul>
Database Manager	<ul style="list-style-type: none"> <li>• Provides oversight for management of project database.</li> </ul>

DQOs – data quality objective  
 FSP – field sampling plan  
 IT – IT Corporation  
 QA – quality assurance  
 QAO – quality assurance officer  
 QAPP – quality assurance project plan  
 QC – quality control  
 SAP – sampling and analysis plan  
 SWDIV – Southwest Division Naval Facilities Engineering Command

**Table 2-1**  
**Project-Required Reporting Limits**

Parameter/ Method	Analyte	Water		
		RL	MCL	Unit
Volatiles EPA 8260B	1,1,1-Trichloroethane	5	200	µg/L
	1,1,2,2-Tetrachloroethane	1	1	µg/L
	1,1,2-Trichloroethane	5	5	µg/L
	1,1-Dichloroethane (DCA)	5	5	µg/L
	1,1-Dichloroethene (DCE)	5	6	µg/L
	1,2-DCA	0.5	0.5	µg/L
	1,2-Dichloropropane	5	5	µg/L
	2-Butanone (MEK)	50	NA	µg/L
	2-Chloroethylvinyl ether	50	NA	µg/L
	2-Hexanone	50	NA	µg/L
	4-Methyl-2-pentanone (MIBK)	50	NA	µg/L
	Acetone	50	NA	µg/L
	Benzene	1	1	µg/L
	Bromodichloromethane	5	NA	µg/L
	Bromoform	5	NA	µg/L
	Bromomethane	5	NA	µg/L
	Carbon disulfide	5	NA	µg/L
	Carbon tetrachloride	0.5	0.5	µg/L
	Chlorobenzene	5	70	µg/L
	Chloroethane	5	NA	µg/L
	Chloroform	5	NA	µg/L
	Chloromethane	5	NA	µg/L
	cis-1,2-DCE	5	6	µg/L
	cis-1,3-Dichloropropene	0.5	0.5	µg/L
	Dibromochloromethane	5	NA	µg/L
	Ethylbenzene	5	700	µg/L
	Methylene chloride	5	5	µg/L
	Methyl tert-butyl ether (MTBE)	10	13	µg/L
	Styrene	5	100	µg/L
	Trichloroethene (TCE)	5	5	µg/L
	Tetrachloroethene	5	5	µg/L
	Toluene	5	150	µg/L
	trans-1,2-DCE	5	10	µg/L
	trans-1,3-Dichloropropene	5	NA	µg/L
	Vinyl acetate	50	NA	µg/L
	Vinyl chloride	0.5	0.5	µg/L
	Xylenes, total	5	1,750	µg/L
Semivolatiles EPA 8270C	1,2,4-Trichlorobenzene	10	70	µg/L
	1,2-Dichlorobenzene	10	600	µg/L
	1,3-Dichlorobenzene	10	NA	µg/L
	1,4-Dichlorobenzene	5	5	µg/L
	2,4,5-Trichlorophenol	10	NA	µg/L
	2,4,6-Trichlorophenol	10	NA	µg/L
	2,4-Dichlorophenol	10	NA	µg/L
	2,4-Dimethylphenol	10	NA	µg/L
	2,4-Dinitrophenol	50	NA	µg/L

**Table 2-1**  
**Project-Required Reporting Limits**

Parameter/ Method	Analyte	Water		
		RL	MCL	Unit
Semivolatiles EPA 8270C (Continued)	2,4-Dinitrotoluene	10	NA	µg/L
	2,6-Dinitrotoluene	10	NA	µg/L
	2-Chloronaphthalene	10	NA	µg/L
	2-Chlorophenol	10	NA	µg/L
	2-Methyl-4,6-dinitrophenol	10	NA	µg/L
	2-Methylnaphthalene	10	NA	µg/L
	2-Methylphenol	10	NA	µg/L
	2-Nitroaniline	10	NA	µg/L
	2-Nitrophenol	10	NA	µg/L
	3,3'-Dichlorobenzidine	10	NA	µg/L
	3-Nitroaniline	10	NA	µg/L
	4-Bromophenyl phenyl ether	10	NA	µg/L
	4-Chloroaniline	10	NA	µg/L
	4-Chloro-3-methylphenol	10	NA	µg/L
	4-Chlorophenyl phenyl ether	10	NA	µg/L
	4-Methylphenol	10	NA	µg/L
	4-Nitroaniline	10	NA	µg/L
	4-Nitrophenol	50	NA	µg/L
	Acenaphthene	10	NA	µg/L
	Acenaphthylene	10	NA	µg/L
	Anthracene	10	NA	µg/L
	Benzo(a)anthracene	10	NA	µg/L
	Benzo(a)pyrene <sup>b</sup>	0.2	0.2	µg/L
	Benzo(b)fluoranthene	10	NA	µg/L
	Benzo(ghi)perylene	10	NA	µg/L
	Benzo(k)fluoranthene	10	NA	µg/L
	Benzyl butyl phthalate	10	NA	µg/L
	Bis(2-chloroethoxy) methane	10	NA	µg/L
	Bis(2-chloroethyl)ether	10	NA	µg/L
	Bis(2-chloroisopropyl)ether	10	NA	µg/L
	Bis(2-ethylhexyl)phthalate	4	4	µg/L
	Chrysene	10	NA	µg/L
	Dibenzo(a,h)anthracene	10	NA	µg/L
	Dibenzofuran	10	NA	µg/L
	Diethyl phthalate	10	NA	µg/L
	Dimethyl phthalate	10	NA	µg/L
	Di-n-butylphthalate	10	NA	µg/L
	Di-n-octylphthalate	10	NA	µg/L
	Fluoranthene	10	NA	µg/L
	Fluorene	10	NA	µg/L
	Hexachlorobenzene	1	1	µg/L
	Hexachlorobutadiene	10	NA	µg/L
	Hexachlorocyclopentadiene	10	50	µg/L
	Hexachloroethane	10	NA	µg/L
	Indeno(1,2,3-cd)pyrene	10	NA	µg/L
	Isophorone	10	NA	µg/L

**Table 2-1**  
**Project-Required Reporting Limits**

Parameter/ Method	Analyte	Water		
		RL	MCL	Unit
Semivolatiles EPA 8270C (Continued)	Naphthalene	10	NA	µg/L
	Nitrobenzene	10	NA	µg/L
	N-Nitrosodiphenylamine	10	NA	µg/L
	N-Nitrosodi-n-propylamine	10	NA	µg/L
	Phenanthrene	10	NA	µg/L
	Phenol	10	NA	µg/L
	Pyrene	10	NA	µg/L
Semivolatiles EPA 8151A	Pentachlorophenol	1	1	µg/L
Pesticides EPA 8081A	α-BHC	0.03	0.2	µg/L
	β-BHC	0.03	0.2	µg/L
	δ-BHC	0.03	0.2	µg/L
	γ-BHC (Lindane)	0.03	0.2	µg/L
	α-Chlordane	0.03	0.1	µg/L
	γ-Chlordane	0.03	0.1	µg/L
	4,4'-DDD	0.50	NA	µg/L
	4,4'-DDE	0.58	NA	µg/L
	4,4'-DDT	0.1	NA	µg/L
	Aldrin	0.03	NA	µg/L
	Dieldrin	0.03	NA	µg/L
	Endosulfan I	0.03	NA	µg/L
	Endosulfan II	0.1	NA	µg/L
	Endosulfan Sulfate	0.1	NA	µg/L
	Endrin	0.03	2	µg/L
	Endrin Aldehyde	0.1	NA	µg/L
	Endrin Ketone	0.1	NA	µg/L
	Heptachlor	0.01	0.01	µg/L
	Heptachlor Epoxide	0.01	0.01	µg/L
	Methoxychlor	0.04	40	µg/L
	Toxaphene	3	3	µg/L
CCR Title 22 Metals EPA 6020	Antimony	6	6	µg/L
	Arsenic	5	50	µg/L
	Barium	100	1,000	µg/L
	Beryllium	4	4	µg/L
	Cadmium	5	5	µg/L
	Chromium	50	50	µg/L
	Cobalt	50	NA	µg/L
	Copper	1	1,000 <sup>a</sup>	µg/L
	Lead	5	15	µg/L
	Molybdenum	100	NA	µg/L
	Nickel	100	100	µg/L
	Selenium	5	50	µg/L
	Silver	50	100 <sup>a</sup>	µg/L
	Thallium	2	2	µg/L
	Vanadium	100	NA	µg/L
	Zinc	20	5,000	µg/L

**Table 2-1**  
**Project-Required Reporting Limits**

Parameter/ Method	Analyte	Water		
		RL	MCL	Unit
Additional Metals EPA 6010B	Calcium	100	NA	µg/L
	Iron	50	300 <sup>a</sup>	µg/L
	Magnesium	50	NA	µg/L
	Manganese	5	50 <sup>a</sup>	µg/L
	Potassium	100	NA	µg/L
	Sodium	1,000	NA	µg/L
EPA 7470A	Mercury	0.2	2	µg/L
Anions EPA 300.0 EPA 353.3	Chloride	1	500 <sup>a</sup>	mg/L
	Nitrate	0.5	45	mg/L
	Nitrite	0.5	1	mg/L
	Sulfate	1	500 <sup>a</sup>	mg/L
RSK-175	Dissolved Methane	0.003	NA	mg/L
EPA 310.1	Alkalinity	2	NA	mg/L
EPA 160.1	Total dissolved solids	4	1,000 <sup>a</sup>	mg/L
EPA 415.1	Total organic carbon	1	NA	mg/L
EPA 350.2	Ammonia	0.2	NA	mg/L

<sup>a</sup>Secondary maximum contaminant level.

<sup>b</sup>Benzo(a)pyrene to be analyzed by 8270C - SIM.

CCR – California Code of Regulations

EPA – U.S. Environmental Protection Agency

MCL – maximum contaminant level

mg/L – milligrams per liter

NA – not applicable

RL – reporting limit

SIM – selected ion monitoring

VOCs – volatile organic compounds

µg/kg – micrograms per kilogram

µg/L – micrograms per liter

**Table 2-2**  
**Analytical QC Acceptance Criteria**

Method	Analyte	Accuracy Water (%R)	Precision Water (% RPD)
EPA 8260B VOCs	1,1-Dichloroethene	75-125	≤ 20
	Benzene	75-125	≤ 20
	Chlorobenzene	75-125	≤ 20
	Trichloroethene	71-125	≤ 20
	Toluene	74-125	
	<b>Surrogates:</b>		
	Dibromofluoromethane	75-125	
	Toluene-D8	75-125	
EPA 8270C SVOCs	4-Bromofluorobenzene	75-125	
	1,2-Dichloroethane-D4	62-139	
	1,2,4-Trichlorobenzene	44-142	≤ 20
	1,4-Dichlorobenzene	30-125	≤ 20
	2,4-Dinitrotoluene	39-139	≤ 20
	Acenaphthene	49-125	≤ 20
	n-Nitrosodi-n-propylamine	37-125	≤ 20
	Pyrene	47-136	≤ 20
	2-Chlorophenol	41-125	≤ 20
	4-Chloro-3-Methyl Phenol	44-125	≤ 20
	4-Nitrophenol	25-131	≤ 20
	Phenol	25-125	≤ 20
	<b>Surrogates:</b>		
	2,4,6-Tribromophenol	25-134	
	2-Fluorobiphenyl	43-125	
	2-Fluorophenol	25-125	
EPA 8151A	Nitrobenzene-D5	32-125	
	Phenol-D5	25-125	
	Terphenyl-D14	42-126	
EPA 8081A	Pentachlorophenol	30-135	≤ 20
	<b>Surrogate:</b>	40-139	
	2,4-Dichlorophenol acetate		
	γ-BHC (Lindane)	73-125	≤ 30
	4,4-DDT	34-143	≤ 30
	Aldrin	47-125	≤ 30
	Dieldrin	42-132	≤ 30
	Endrin	43-134	≤ 30
Metals EPA 6020	Heptachlor	45-128	≤ 30
	<b>Surrogates:</b>		
	DCBP	34-133	
	TCMX	45-125	
	Antimony	80-120	≤ 20
	Arsenic	80-120	≤ 20
	Barium	80-120	≤ 20
	Beryllium	80-120	≤ 20
	Cadmium	80-120	≤ 20

**Table 2-2**  
**Analytical QC Acceptance Criteria**

Method	Analyte	Accuracy Water (%R)	Precision Water (% RPD)
<i>Metals</i> <i>EPA 6020</i> <i>(Continued)</i>	Antimony	80-120	≤ 20
	Arsenic	80-120	≤ 20
	Barium	80-120	≤ 20
	Beryllium	80-120	≤ 20
	Cadmium	80-120	≤ 20
	Chromium	80-120	≤ 20
	Cobalt	80-120	≤ 20
	Copper	80-120	≤ 20
	Lead	80-120	≤ 20
	Molybdenum	80-120	≤ 20
	Nickel	80-120	≤ 20
	Selenium	80-120	≤ 20
	Silver	80-120	≤ 20
	Thallium	80-120	≤ 20
	Vanadium	80-120	≤ 20
	Zinc	80-120	≤ 20
<i>Metals</i> <i>EPA 6010B</i>	Calcium	80-120	≤ 20
	Iron	80-120	≤ 20
	Manganese	80-120	≤ 20
	Magnesium	80-120	≤ 20
	Potassium	80-120	≤ 20
	Sodium	80-120	≤ 20
<i>EPA 7470A</i>	Mercury	77-120	≤ 15
<i>Anions</i> <i>EPA 300.0/353.3</i>	Chloride	80-120	≤ 20
	Nitrate	80-120	≤ 20
	Nitrite	80-120	≤ 20
	Sulfate	80-120	≤ 20
<i>EPA 310.1</i>	Alkalinity	80-120	≤ 20
<i>EPA 415.1</i>	Total organic carbon	80-120	≤ 20
<i>EPA 350.2</i>	Ammonia	80-120	≤ 20
<i>EPA 160.1</i>	Total dissolved solids	80-120	≤ 20

EPA – U.S. Environmental Protection Agency  
 QC – quality control  
 SVOCs – semivolatile organic compounds  
 VOCs – volatile organic compounds  
 %R – percent recovery  
 %RPD – percent relative percent difference

**Table 5-1**  
**Sample Containers, Preservatives, and Holding Times**

Analytes	Method	Container	Preservative	Holding Time
<b>Water</b>				
TOC	EPA 415.1	250-mL HDPE	H <sub>2</sub> SO <sub>4</sub> to pH<2 Cool at 4±2 °C	28 days
Sulfate, Chloride	EPA 300.0	250-mL HDPE	Cool at 4±2 °C	28 days
Nitrate, Nitrite	EPA 353.3	250-mL HDPE	H <sub>2</sub> SO <sub>4</sub> to pH<2 Cool at 4±2 °C	28 days
Alkalinity	EPA 310.1	250-mL HDPE	Cool at 4±2 °C	14 days
Ammonia	EPA 350.2	1,000-mL HDPE	H <sub>2</sub> SO <sub>4</sub> , Cool at 4±2 °C	14 days
Total Dissolved Solids	EPA 160.1	250-mL HDPE	Cool at 4±2 °C	7 days
VOCs	EPA 8260B	Three 40-mL volatile organic analysis vials Teflon™-lined septum	HCl, pH<2 Cool at 4±2 °C	14 days (7 days if unpreserved)
Dissolved Methane	RSK-175	Three 40-mL volatile organic analysis vials Teflon™-lined septum	Cool at 4±2 °C	7 days
SVOCs	EPA 8270C	1-liter amber glass bottle	Cool at 4±2 °C	7 days extraction, 40 days to analysis
Organochlorine Pesticides	EPA 8081A	1-liter amber glass bottle	Cool at 4±2 °C	7 days extraction, 40 days to analysis
Pentachlorophenol	EPA 8151A	1-liter amber glass bottle	Cool at 4±2 °C	7 days to extraction, 40 days to analysis
Metals, Total	EPA 6020/6010B/ 7000A	500-mL HDPE	HNO <sub>3</sub> to pH<2 Cool at 4±2 °C	6 months, except 28 days for mercury
Metals, Dissolved	EPA 6020/6010B/ 7000A	500-mL HDPE	Cool at 4±2 °C	6 months, except 28 days for mercury

H<sub>2</sub>SO<sub>4</sub> – sulfuric acid

HCl – hydrochloric acid

HDPE – high-density polyethylene

HNO<sub>3</sub> – nitric acid

mL – milliliter

SVOCs – semivolatile organic compounds

TOC – total organic carbon

VOCs – volatile organic compounds

°C – degrees Celsius

**Table 5-2**  
**Water Quality Stabilization Criteria**

Parameter	Acceptance Criteria <sup>a</sup>
pH	$\pm 0.1$ pH units
Specific conductance	$\pm 3$ percent
Temperature	$\pm 1$ °C
ORP	$\pm 10$ mV
Dissolved oxygen	$\pm 10$ percent
Turbidity	$\pm 10$ percent

<sup>a</sup>Criteria must be met for all parameters for three successive measurements.

mV - millivolts

ORP – oxidation/reduction potential

°C – degrees Celsius

**Table 8-1**  
**Calibration Criteria and Corrective Action Procedures**

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
EPA 8081A	Organochlorine Pesticides	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	%RSD < 20% for calibration or response factors	Correct problem, then repeat initial calibration.
		Second-source calibration verification for all analytes	Once per five-point initial calibration	All analytes within $\pm 15\%$ of expected value	Correct problem, then repeat initial calibration.
		Retention time window calculated for each analyte	Each initial calibration and calibration verifications	$\pm 3$ times standard deviation for each analyte retention time from 72-hour study	Correct problem, then reanalyze all samples analyzed since the last retention time check.
		Initial calibration verification	Daily, before sample analysis	All analytes within $\pm 15\%$ of expected value	Correct problem, then repeat initial calibration.
		Continuing calibration verification	After every 20 samples and at the end of the analysis sequence	All analytes within $\pm 15\%$ of expected value	Correct problem, repeat initial calibration verification, and then reanalyze all samples since last successful calibration verification.
		Breakdown check Endrin and DDT – pesticides analysis only	Daily prior to analysis of samples	Degradation $\leq 15\%$	Repeat breakdown check.
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once per analyst	QC acceptance criteria, Table 2-2	Recalculate results, locate and fix problem with system, and then rerun demonstration for those analytes that did not meet criteria.
		Method blank	One per analytical batch	No analytes detected $\geq$ RL, Table 2-1	Correct problem, reprepare, and then analyze method blank and all samples prepared with the contaminated blank.
		LCS for all analytes	One LCS per analytical batch	QC acceptance criteria, Table 2-2	Correct problem, reprepare, and then analyze LCS and all samples in the affected batch.
		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria, Table 2-2	Correct problem, then reextract and analyze sample.

**Table 8-1**  
**Calibration Criteria and Corrective Action Procedures**

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
EPA 8081A (continued)	Organochlorine Pesticides	MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table 2-2	None.
		Second-column confirmation	100% for all positive results	Same as for initial or primary column analysis	Same as for initial or primary column analysis.
		MDL study	Once per 12-month period	Detection limits < RLs, Table 2-1	None.
		Results reported between MDL and RL	None	None	None.
EPA 8151A	Pentachloro-phenol	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	%RSD < 20% for calibration or response factors	Correct problem, then repeat initial calibration.
		Second-source calibration verification for all analytes	Once per five-point initial calibration	All analytes within $\pm 15\%$ of expected value	Correct problem, then repeat initial calibration.
		Retention time window calculated for each analyte	Each initial calibration and calibration verifications	$\pm 3$ times standard deviation for each analyte retention time from 72-hour study	Correct problem, then reanalyze all samples analyzed since the last retention time check.
		Initial calibration verification	Daily, before sample analysis	All analytes within $\pm 15\%$ of expected value	Correct problem, then repeat initial calibration.
		Continuing calibration verification	After every 20 samples and at the end of the analysis sequence	All analytes within $\pm 15\%$ of expected value	Correct problem, repeat initial calibration verification, and then reanalyze all samples since last successful calibration verification.
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once per analyst	QC acceptance criteria, Table 2-2	Recalculate results, locate and fix problem with system, and then rerun demonstration for those analytes that did not meet criteria.
		Method blank	One per analytical batch	No analytes detected $\geq$ RL, Table 2-1	Correct problem, reprepare, and then analyze method blank and all samples prepared with the contaminated blank.

**Table 8-1**  
**Calibration Criteria and Corrective Action Procedures**

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
EPA 8151 (continued)		LCS for all analytes	One LCS per analytical batch	QC acceptance criteria, Table 2-2	Correct problem, reprepare, and then analyze LCS and all samples in the affected batch.
		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria, Table 2-2	Correct problem, then reextract and analyze sample.
		MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table 2-2	None.
		Second-column confirmation	100% for all positive results	Same as for initial or primary column analysis	Same as for initial or primary column analysis.
		MDL study	Once per 12-month period	Detection limits < RLs, Table 2-1	None.
		Results reported between MDL and RL	None	None	None.
EPA 8260B	Volatile Organics	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	SPCCs average RF $\geq 0.30^b$ ; %RSD for CCCs < 30%; and %RSD for all other calibration analytes $\leq 50\%$	Correct problem, then repeat initial calibration.
		Second-source calibration verification	Once per five-point initial calibration	All analytes within $\pm 25\%$ of expected value	Correct problem, then repeat initial calibration.
		Calibration verification	Daily, before sample analysis and every 12 hours of analysis time	SPCCs average RF $\geq 0.30^b$ ; CCCs < 25% drift; and all calibration analytes within $\pm 50\%$ of expected value	Correct problem, then repeat initial calibration.
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once per analyst	QC acceptance criteria, Table 2-2	Recalculate results, locate and fix problem with system, and then rerun demonstration for those analytes that did not meet criteria.

**Table 8-1**  
**Calibration Criteria and Corrective Action Procedures**

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
EPA 8260B (continued)		Check of mass spectral ion intensities using BFB	Prior to initial calibration and calibration verification	Refer to criteria listed in the method description	Retune instrument and verify.
		Internal standard	Immediately after or during data acquisition of calibration check standard	Retention time $\pm 30$ seconds; EICP area within -50% to +100% of last calibration verification (12 hours) for each	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.
		Method blank	One per analytical batch	No analytes $\geq$ RL, Table 2-1	Correct problem and then reprepare and analyze method blank and all samples processed with the contaminated blank
		LCS for all analytes	One LCS per analytical batch	QC acceptance criteria, Table 2-2	Correct problem and then reprepare and analyze the LCS and all samples in the affected analytical batch.
		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria, Table 2-1	Reanalyzed, correct problem, and then reextract and analyze sample.
		MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table 2-1	None.
		MDL study	Once per 12-month period	Detection limits < RLs, Table 2-1	None.
		Results reported between MDL and RL	None	None	Report results and qualify with a "J."
EPA 8270C	Semivolatile Organics	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	SPCCs average RF $\geq 0.30\%$ ; %RSD for CCCs < 30%; and %RSD for all other calibration analytes $\leq 15\%$	Correct problem, then repeat initial calibration.
		Second-source calibration verification (use LCS spike)	Once per five-point initial calibration	All analytes within $\pm 25\%$ of expected value	Correct problem, then repeat initial calibration.

**Table 8-1**  
**Calibration Criteria and Corrective Action Procedures**

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
EPA 8270C (continued)		Retention time window calculated for each analyte	Each initial calibration and calibration verifications	$\pm 3$ times standard deviation for each analyte retention time from 72-hour study	Correct problem, then reanalyze all samples analyzed since the last retention time check.
		Calibration verification	Daily, before sample analysis and every 12 hours of analysis time	SPCCs average RF $\geq 0.05$ ; CCCs $< 20\%$ drift; and all calibration analytes within $\pm 20\%$ of expected value	Correct problem, then repeat initial calibration.
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once per analyst	QC acceptance criteria, Table 2-2	Recalculate results, locate and fix problem with system, and then rerun demonstration for those analytes that did not meet criteria.
		Check of mass spectral ion intensities using DFTPP	Prior to initial calibration and calibration verification	Refer to criteria listed in Method SW846	Retune instrument and verify.
		Internal standards	Immediately after or during data acquisition of calibration check standard	Retention time $\pm 30$ seconds; EICP area within $-50\%$ to $+100\%$ of last calibration verification (12 hours) for each	Inspect mass spectrometer and GC for malfunctions and reanalyze all samples analyzed while system was malfunctioning.
		Method blank	One per analytical batch	No analytes detected $\geq$ RL, Table 2-1	Correct problem, then reprepare and analyze method blank and all samples processed with the contaminated blank.

**Table 8-1**  
**Calibration Criteria and Corrective Action Procedures**

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
EPA 8270C (continued)		LCS for all analytes	One LCS per analytical batch	QC acceptance criteria, Table 2-2	Correct problem, then reprepare and analyze the LCS and all samples in the affected analytical batch.
		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria, Table 2-2	Correct problem, then reextract and analyze sample.
		MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table 2-2	None.
		MDL study	Once per 12-month period	Detection limits < RLs in Table 2-1	None.
		Results reported between MDL and RL	None	None	None.
EPA 6020	ICP/MS Metals	MS tuning sample	Prior to initial calibration and calibration verification	1) Mass calibration $\leq 1$ amu from true value 2) Resolution < 0.9 amu full width at 10 percent peak height	Retune instrument then reanalyze tuning solution.
		ICV (minimum 5 standards and a blank)	Daily prior to sample analysis	$r \geq 0.995$ or $r^2 \geq 0.990$	Reanalyze, identify and correct problem, and recalibrate.
		ICB	Immediately following the ICV	< RL, Table 2-1	Correct problem, then reanalyze ICB.
		CCV	Daily prior to sample analysis, after every 10 samples, and at the end of the analysis sequence	90 to 110%	Reanalyze CCV. Reanalyze all samples back to last acceptable CCV.
		CCB	Immediately after the CCV	< RL, Table 2-1	Reanalyze all samples back to last acceptable CCB.
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once per analyst	QC acceptance criteria, Table 2-2	Recalculate results, locate and fix problem with system, and then rerun demonstration for those analytes that did not meet criteria.

**Table 8-1**  
**Calibration Criteria and Corrective Action Procedures**

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
EPA 6020 (continued)		Method blank	One per analytical batch	RL, Table 2-1	Reanalyze, correct problem, reprepare, and then analyze method blank and all samples prepared with the contaminated blank.
		Interference Check Sample	Beginning and end of an analytical run or twice during an 8-hour period, whichever is more frequent	Within $\pm 20\%$ of expected value	Reanalyze, terminate analysis, correct problem, reanalyze ICS, and then reanalyze all affected samples.
		LCS	Daily for each preparation batch of 20 samples or less	QC acceptance criteria, Table 2-2	Reanalyze LCS, prepare a new LCS, and reanalyze all affected samples.
		MS/MSD	One per batch of 20 samples or less	QC acceptance criteria, Table 2-2	None.
		Dilution Test	Each new sample matrix	1:4 dilution must agree within $\pm 10\%$ of the original determination	Perform post digestion spike addition.
		Post digestion spike addition	When dilution test fails	Recovery within 75 to 125% of expected results	Correct problem, then reanalyze postdigestion spike addition.
		MDL study	Once per 12-month period	Detection limits < RLs in Table 2-1	None.
		Results reported between MDL and RL	None	None	Report results and qualify with a "J."
EPA 6010B	ICP Metals	ICV (minimum 5 standards and a blank)	Daily prior to sample analysis	$r > 0.995$ or $r^2 \geq 0.990$	Reanalyze, identify and correct problem, and recalibrate.
		ICB	Immediately following the ICV	<RL, Table 2-1	Correct problem, then reanalyze ICB.
		CCV	Daily prior to sample analysis, after every 10 samples, and at the end of the analysis sequence	90 to 110%	Reanalyze CCV. Reanalyze all samples back to last acceptable CCV.
		CCB	Immediately after the CCV	<RL, Table 2-1	Reanalyze all samples back to last acceptable CCB.

**Table 8-1**  
**Calibration Criteria and Corrective Action Procedures**

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
EPA 6010B (continued)		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once per analyst	QC acceptance criteria, Table 2-2	Recalculate results, locate and fix problem with system, and then rerun demonstration for those analytes that did not meet criteria.
		Method blank	One per analytical batch	<RL, Table 2-1	Reanalyze, correct problem, reprepare, and then analyze method blank and all samples prepared with the contaminated blank.
		Interference Check Sample	Beginning and end of an analytical run or twice during an 8-hour period, whichever is more frequent	Within $\pm 20\%$ of expected value	Reanalyze, terminate analysis, correct problem, reanalyze ICS, and then reanalyze all affected samples.
		LCS	Daily for each preparation batch of 20 samples or less	QC acceptance criteria, Table 2-2	Reanalyze LCS, prepare a new LCS, and reanalyze all affected samples.
		MS/MSD	One per batch of 20 samples or less	QC acceptance criteria, Table 2-2	None.
		Dilution Test	Each new sample matrix	1:4 dilution must agree within $\pm 10\%$ of the original determination	Perform post digestion spike addition.
		Post digestion spike addition	When dilution test fails	Recovery within 75 to 125% of expected results	Correct problem, then reanalyze postdigestion spike addition.
		MDL study	Once per 12-month period	Detection limits < RLs in Table 2-1	None.
		Results reported between MDL and RL	None	None	Report results and qualify with a "J."

**Table 8-1**  
**Calibration Criteria and Corrective Action Procedures**

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
EPA 7470A	Mercury	Initial multipoint calibration (minimum 5 standards and a blank)	Daily initial calibration prior to sample analysis	Correlation coefficient $\geq 0.995$ for linear regression	Correct problem, then repeat initial calibration
		Second-source calibration check standard	Once per initial daily multipoint calibration	Analyte within $\pm 10\%$ of expected value	Correct problem, then repeat initial calibration
		Calibration blank	Once per initial daily multipoint calibration	No analyte detected $\geq$ RL	Correct problem, then reanalyze calibration blank and all samples prepared with blank
		Continuing calibration verification	After every 10 samples and at the end of the analysis sequence	Analyte within $\pm 20\%$ of expected value	Correct problem, then repeat calibration and reanalyze all samples since last successful calibration
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once per analyst	QC acceptance criteria, Table 2-2	Recalculate results, locate and fix problem with system, and then rerun demonstration for those analytes that did not meet criteria
		Method blank	One per analytical batch	No analytes detected $\geq$ RL, Table 2-1	Correct problem, then reprepare and analyze blank and all samples prepared with the contaminated blank
		LCS for the analyte	One LCS per analytical batch	QC acceptance criteria, Table 2-2	Correct problem, then reprepare and analyze LCS and all samples in affected batch
		New matrix check; five-fold dilution test	Each new sample matrix	Five times dilution sample result must be $\pm 10\%$ of the undiluted sample result	Perform recovery test
		Recovery test	When new matrix check fails	Recovery within 85 to 115% of expected results	Run all samples by the method of standard addition
		MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table 2-2	None

**Table 8-1**  
**Calibration Criteria and Corrective Action Procedures**

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
EPA 7470A (continued)		MDL study	Once per 12-month period	Detection limits < RLs, Table 2-1	None
EPA 300.0, 353.3, 310.1, 415.1, 350.2	Anions, Alkalinity, Total Organic Carbon, Ammonia	Initial multipoint calibration (minimum 5 standards and a blank)	Initially and as required	$r \geq 0.995$ or $r^2 \geq 0.990$	Correct problem, then repeat initial calibration.
		ICV	Daily prior to sample analysis	90 to 110%	Reanalyze ICV, prepare new ICV, and analyze and recalibrate.
		ICB	Immediately following the ICV	<RL, Table 2-1	Reanalyze, identify and correct problem, and recalibrate.
		CCV	After every 10 samples and at the end of the analysis sequence	90 to 110%	Reanalyze CCV, and reanalyze all samples back to last acceptable CCV.
		CCB	Immediately after the CCV	<RL, Table 2-1	Reanalyze all samples back to last acceptable CCB.
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once per analyst	QC acceptance criteria, Table 2-2	Recalculate results, locate and fix problem with system, and then rerun demonstration for those analytes that did not meet criteria.
	Anions, Alkalinity, Total Organic Carbon, Ammonia	LCS	Daily for each preparation batch of 20 samples or less	QC acceptance criteria, Table 2-2	Reanalyze LCS, prepare a new LCS, and reanalyze all affected samples.
		MS/MSD	One per batch of 20 samples or less	QC acceptance criteria, Table 2-2	None.
		MDL study	Once per 12-month period	Detection limits < RLs in Table 2-1	None.
		Results reported between MDL and RL	None	None	Report results and qualify with a "J."

**Table 8-1**  
**Calibration Criteria and Corrective Action Procedures**

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action <sup>a</sup>
EPA 160.1	Total Dissolved Solids	Initial multipoint calibration (minimum 5 standards and a blank)	Initially and as required	$r \geq 0.995$ or $r^2 \geq 0.990$	Correct problem, then repeat initial calibration.
		ICV	Daily prior to sample analysis	90 to 110%	Reanalyze ICV, prepare new ICV and analyze, and recalibrate.
		ICB	Immediately following the ICV	<RL, Table 2-1	Reanalyze, identify and correct problem, and recalibrate.
		CCV	After every 10 samples and at the end of the analysis sequence	90 to 110%	Reanalyze CCV, and reanalyze all samples back to last acceptable CCV.
		CCB	Immediately after the CCV	<RL, Table 2-1	Reanalyze all samples back to last acceptable CCB.
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once per analyst	QC acceptance criteria, Table 2-2	Recalculate results, locate and fix problem with system, and then rerun demonstration for those analytes that did not meet criteria.
		LCS	Daily for each preparation batch of 20 samples or less	QC acceptance criteria, Table 2-2	Reanalyze LCS, prepare a new LCS, and reanalyze all affected samples.
		MDL study	Once per 12-month period	Detection limits < RLs in Table 2-1	Perform immediately.
		Results reported between MDL and RL	None	None	Report results and qualify with a "J."

<sup>a</sup>All corrective actions associated with IT project work must be documented and all records must be maintained by the laboratory.

<sup>b</sup>Except > 0.10 for Bromoform, and > 0.01 for Chloromethane and 1,1-Dichloroethane.

amu – atomic mass unit

BFB – bromofluorobenzene

BTEX – benzene, toluene, ethylbenzene, and total xylenes

CA LUFT – California leaking underground fuel tank

CCB – continuing calibration blank

CCC – calibration check compound

**Table 8-1**  
**Calibration Criteria and Corrective Action Procedures**

*CCV – continuing calibration verification*  
*DFTPP – decafluorotriphenylphosphine*  
*EICP – extracted ion current profile*  
*EPA – U.S. Environmental Protection Agency*  
*GC – gas chromatography*  
*ICB – initial calibration blank*  
*ICP/MS – inductively coupled plasma/mass spectrometry*  
*ICV – initial calibration verification*  
*J – estimated value between MDL and RL*  
*LCS – laboratory control sample*  
*M – modified*  
*MDL – method detection limit*  
*MS/MSD – matrix spike/matrix spike duplicate*  
*PCBs – polychlorinated biphenyls*  
*QC – quality control*  
*RF – response factor*  
*RL – reporting limit*  
*SPCC – system performance check compound*  
*TPH – total petroleum hydrocarbons*  
*TO – toxic organics*  
*%RSD – percent relative standard deviation*

**Table 10-1**  
**GC or HPLC Data Deliverables Package Requirements**

Method	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package, Level IV	SW-846 Package, Level III	Standard Laboratory Report
Organic Analysis by GC or HPLC	Case Narrative		X	X	X
	Corrective Action Report(s)		X	X	X
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		X	X	X
	Chain-of-Custody Form, Cooler Receipt form		X	X	X
	Sample log-in sheet	DC-1	X		
	Complete SDG file inventory sheet	DC-2-1	X		
	Data summary for each blank and sample (1)	I	X	X	X
	Lab Control Sample/Laboratory Control Duplicate (LCS/LCD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	III (modified)	X	X	X
	Surrogate recovery report (including concentration spiked, percent recovered, and percent recovery acceptance limits)	II	X	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	III	X	X	X
	Initial calibration data for each column (indicate which column was used for quantitation)	VI	X	X	
	Continuing calibration data (indicate which column was used for quantitation) and calibration verification data	VII	X	X	
	Chromatograms for each sample (and reruns), confirmation runs, blank, spike, duplicate, and standards		X	X (3)	
	Instrument quantitation report		X	X	
	Method blank summary	IV	X		
	Pesticide identification summary	X	X		
	Sample preparation bench sheets		X	X	
	Gel permeation chromatography clean-up logs		X		
	Standard preparation logs		X	X	
	Analysis run logs	VIII	X	X	
	Percent moisture		X	X	X

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, extracted/analyzed, Practical Quantitation Limit, Method Detection Limit, dilution factor(s), comments, approval signature/date. Results from the primary and secondary columns/detector shall be reported.

3) For petroleum fuels or PCB analyses chromatograms for samples with compound detection only.

EPA – U.S. Environmental Protection Agency  
GC – gas chromatography

HPLC – high-performance liquid chromatography  
IDs – identifications

**Table 10-2**  
**GC/MS Data Deliverables Package Requirements**

Method	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package Level IV	SW-846 Package, Level III	Standard Laboratory Report
Organic Analysis by GC/MS	Case Narrative		X	X	X
	Corrective Action Report(s)		X	X	X
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		X	X	X
	Chain-of-Custody Form, Cooler Receipt Form		X	X	X
	Sample log-in sheet	DC-1	X		
	Complete SDG file inventory sheet	DC-2-1	X		
	Data summary for each blank and sample (1)	I	X	X	X
	Tentatively identified compounds (TICs) for each sample (ten peaks)	I, TIC	X	X	
	Lab Control Sample/Laboratory Control Duplicate (LCS/LCD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	III (modified)	X	X	X
	Surrogate recovery report (including concentration spiked, percent recovered, and percent recovery acceptance limits)	II	X	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	III	X	X	X
	Instrument performance check (tuning) report	V	X	X	
	Initial calibration data (including acceptance limits)	VI	X	X	
	Continuing calibration data (including acceptance limits)	VII	X	X	
	Internal standard areas and retention time reports (including acceptance limits and out-of-control flags)	VIII	X	X	
	Reconstructed ion chromatogram for each sample and rerun, blank, spike, duplicate, and standard		X		
	Instrument quantitation report		X	X	
	Raw and background subtracted mass spectra for each target analyte found		X		
	Mass spectra of TICs with library spectra of five best-fit matches		X		
	Sample preparation bench sheets		X	X	
	Gel permeation chromatography clean-up logs		X		
	Method blank summary	IV	X		
	Standard preparation logs		X	X	
	Analysis run logs	VIII	X	X	
	Percent moisture		X	X	X
	pH		X (2)		

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, extracted/analyzed, Practical Quantitation Limits, Method Detection Limit, dilution factor(s), results, comments, approval signature/date.

2) For water samples volatile analysis only.

EPA – U.S. Environmental Protection Agency  
GC – gas chromatography

IDs - identifications  
MS – mass spectrometry

**Table 10-3**  
**Inorganic Data Deliverables Package Requirements**

Method	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package	SW-846 Package	Standard Laboratory Report
Inorganic Chemistry	Case narrative		x	x	x
	Corrective action report(s)		x	x	x
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		x	x	x
	Chain-of-Custody Form, Cooler Receipt Form		x	x	x
	Sample log-in sheet	DC-1	x		
	Complete SDG file inventory sheet	DC-2-1	x		
	Data summary for each blank and sample (1)	I-IN	x	x	x
	Laboratory Control Sample/Laboratory Control Duplicate (LCS/LCD) report (concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	VII-IN	x	x	x
	Matrix Spike (MS) report (concentration spiked, percent recovered, percent recovery acceptance limits)	V(PART1)-IN	x	x	x
	Duplicate sample report	VI-IN	x	x	x
	Calibrations, initial and verification	II(PART1)-IN	x	x	
	Copies of sample preparation logs	XIII	x	x	
	Copies of analysis run logs	XIV	x	x	
	Raw data and instrument printouts		x		
	Copies of standard preparation logs		x	x	
	Percent moisture		x	x	x

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, extracted/analyzed, analytical results, dilution factors, PQLs, MDLs, comments, approval signature/date.

EPA – U.S. Environmental Protection Agency

IDs – identifications

QC – quality control

**Table 10-4**  
**Metals Data Deliverables Package Requirements**

Method	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package, Level IV	SW-846 Package, Level III	Standard Laboratory Report
Metals Analysis	Case Narrative		X	X	X
	Corrective Action Report(s)		X	X	X
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		X	X	X
	Chain-of-Custody Form, Cooler Receipt form		X	X	X
	Sample log-in sheet	DC-1	X		
	Complete SDG file inventory sheet	DC-2-1	X		
	Data summary for each blank and sample (1)	I-IN	X	X	X
	Lab Control Sample/Laboratory Control Duplicate (LCS/LCD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	VII-IN	X	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	V (Part 1)-IN	X	X	X
	Instrument performing check (tuning) report	V	X	X	
	Post-digestion spike recovery	V (Part 2)-IN	X	X	X
	Duplicate sample report	VI-IN	X	X	X
	Blank results	III-IN	X	X	X
	Initial and continuing calibration data	II (PART I)-IN	X	X	
	ICP interference check sample report	IV-IN	X	X	
	Standard addition results	VIII-IN	X	X	
	ICP serial dilution results	IX-IN	X		
	Preparation logs	XIII-IN	X	X	
	Analysis run logs	XIV-IN	X	X	
	Standard preparation logs		X	X	
	CRDL standard report	II (Part 2)-IN	X		
	Instrument detection limits	X-IN	X		
	ICP interelement correction factors	XI-IN	X	X	
	Data and instrument printouts		X		
	Percent moisture		X	X	X
	pH		X (2)		

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, extracted/analyzed, Practical Quantitation Limit, Method Detection Limit, dilution factor(s), results, comments, approval signature/date.

2) For water samples only.

EPA – U.S. Environmental Protection Agency

IDs – identifications

QC – quality control

**APPENDIX A**  
**MICROPURGE (LOW-FLOW) SAMPLING OF WELLS USING NON-DEDICATED PUMPS**  
**WITH DEDICATED TUBING**

## PROCEDURE

### Subject: Micropurge (Low-Flow) Sampling of Wells Using Non-Dedicated Pumps With Dedicated Tubing

#### 1.0 SCOPE AND APPLICATION

- 1.1 This procedure is the IT – Irvine standard method for collecting low stress (low flow) ground water samples from monitoring wells. Low stress purging and sampling results in collection of ground water samples from monitoring wells that are representative of ground water conditions in the geological formation. This is accomplished by minimizing stress on the geological formation and minimizing disturbance of sediment that has collected in the well. The procedure applies to monitoring wells that have an inner casing with a diameter of 2.0 inches or greater, and maximum screened intervals of twenty feet unless multiple intervals are sampled. The procedure is appropriate for collection of ground water samples that will be analyzed for volatile and semi-volatile organic compounds (VOCs and SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, and microbiological and other contaminants in association with all EPA programs. This procedure should be followed when low-flow GW sampling is required within the screen zone and when dedicated pumps are not in a well.
- 1.2 This procedure does not address the collection of light or dense non- aqueous phase liquids (LNAPL or DNAPL) samples, and should be used for aqueous samples only. For sampling NAPLs, the reader is referred to the following EPA publications: DNAPL Site Evaluation (Cohen & Mercer, 1993) and the RCRA Ground-Water Monitoring: Draft Technical Guidance (EPA/530-R-93-001), and references therein.

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### **3.0 SUMMARY OF PROCEDURE**

- 3.1** Prior to purging the well, a depth-to-water (DTW) measurement is made for the well. A length of dedicated tubing is attached to a fully decontaminated non-dedicated bladder pump. The pump is slowly lowered into the well in a manner that will minimize disturbance of the water column and secured with safety line. The pump should be set at a depth that is either at mid-screen interval or at the mid-point between the depth-to-water and the bottom of the screen interval, whichever point is deeper.
- 3.2** When the sampler is ready to purge the well, the controller is attached to the air line and the flow cell is attached to the water line leading from the pump. The water level meter (or draw down, if available) is lowered into the well. The compressor is started to provide compressed air to the controller (if in a remote location, a CO2 cylinder with backpack may be used). The water level will be monitored every two minutes if a water level meter is used. The water is pumped until the readings from a flow cell instrument become stable at a pump flow rate of 120 to 500 ml per minute. Confirm that draw down on the water column is no more than 0.3 ft below initial DTW through use of the draw down meter or water level meter. Once the readings are stable, the sample can be collected at a lower flow rate into the appropriate bottles for each method. The bottles are appropriately labeled and prepared for shipment.
- 3.3** The equipment is then removed from the well and decontaminated prior to sampling at the next well.

### **4.0 ADDRESSING POTENTIAL HAZARDS**

Problems that may be encountered using this technique include a) difficulty in sampling wells with insufficient yield; b) failure of one or more key indicator parameters to stabilize; c) cross-contamination between wells; and d) equipment failures.

- 4.1** Insufficient Yield - Wells with insufficient yield (i.e., low recharge rate of the well) may dewater during purging. Care should be taken to avoid loss of pressure in the tubing line due to dewatering of the well below the level of the pump's intake. Purging should be adjusted to a slower rate to help prevent the water level in the well from dropping 0.3 feet below the initial water level table, as this may induce cascading of the sand pack. If the pump rate is slowed to the minimum flow and the drawdown continues to drop below 0.3 feet, continue pumping and note the drawdown effect in the well. If the drawdown continues below one foot at the minimal flow rate, stop pumping and evaluate whether this purge technique is appropriate for the well. Pumping the well dry should be avoided to the extent possible in all cases.
- 4.2** Failure to Stabilize Key Indicator Parameters - If one or more key indicator parameters fails to stabilize after 4 hours, one of four options should be considered: a) continue purging in an attempt to achieve stabilization; b) discontinue purging, do not collect samples, and document attempts to reach stabilization in the log book; c) discontinue purging, collect samples, and document attempts to reach stabilization in the log book; or d) Secure the well, purge and collect samples the next day (preferred). The key indicator parameter

for samples to be analyzed for VOCs is dissolved oxygen. The key indicator parameter for all other samples is turbidity.

- 4.3 Cross-Contamination - To help prevent cross-contamination between wells, dedicated tubing and disposable pump bladders are to be used for all wells. To reduce the chance of cross-contamination from the non-dedicated portion of the pump, thorough "daily" decontamination procedures should be followed at the beginning of each day and between sampling of each well.
- 4.4 Equipment Failure - Adequate equipment should be on-hand so that equipment failures do not adversely impact sampling activities.

## 5.0 DEFINITIONS

- 5.1 COC – chain-of-custody  
5.2 DI – deionized water  
5.3 DO – dissolved oxygen  
5.4 DNAPL – dense non-aqueous phase liquids  
5.5 DTW – depth-to-water  
5.6 EPA – U.S. Environmental Protection Agency  
5.7 FSP – field sampling plan  
5.8 HAZWOPER - Hazardous Waste Operations and Emergency Response Standard  
5.9 HCl – hydrochloric acid  
5.10 HDPE – high density polyethylene  
5.11 HNO<sub>3</sub> – nitric acid  
5.12 H<sub>2</sub>SO<sub>4</sub> – sulfuric acid  
5.13 Site HSP – Site health and safety plan  
5.14 LNAPL – light non-aqueous phase liquids  
5.15 NA – not applicable  
5.16 ORP – oxidation/reduction potential  
5.17 PID – photo-ionization detector  
5.18 PCB – polychlorinated biphenyls  
5.19 PPE – personal protection equipment  
5.20 QC – quality control.  
5.21 SAP – sampling and analysis plan  
5.22 IT – IT Corporation  
5.23 VOA – volatile organic analysis  
5.24 DI – deionized  
5.25 MCMWTC – Marine Corps Mountain Warfare Training Center  
5.26 MSDS – Material Safety Data Sheets  
5.27 OSHA – Occupational Safety and Health Administration  
5.28 RCRA – Resource Conservation and Recovery Act  
5.29 SVOC – Semivolatile organic compound  
5.30 VOC – Volatile organic compound

## 5.0 SAFETY

- 5.1 Procedures shall be carried out in a manner that protects the health and safety of all IT associates.
- 5.2 The Site Health and Safety Plan (HSP) gives details about the specific health and safety practices which are to be followed in the sampling site area. Personnel must have training in the Site HSP, including the written Hazard Communication

plan, prior to working on the site. In addition, all employees must have taken the 40-Hour OSHA HAZWOPER course with current updated 8-hour refresher training. Consult the Site HSP and available Material Safety Data Sheets (MSDS) prior to using the chemicals in the sampling method or coming in contact with possible contaminants at the site.

- 5.3 Consult the Site Health and Safety Plan for information on Personal Protective Equipment. A minimum of level D protection must be worn in the field (Tyvec™ suits, if required, and appropriate eyewear). Appropriate gloves must be worn while sampling equipment, samples, standards, solvents, and reagents are being handled. Disposable gloves that have been contaminated will be removed and discarded. Disposable gloves shall not be reused.
- 5.4 The health and safety hazards of many of the chemicals used in this procedure have not been fully defined; therefore each chemical compound should be treated as a potential health hazard. Additional health and safety information can be obtained from the MSDS files maintained in the field.
- 5.5 Exposure to chemicals must be maintained as low as reasonably achievable. All work must be stopped in the event of a known or potential compromise to the health and safety of an IT associate. The situation must be reported immediately to the health and safety officer and or the site supervisor.
- 5.6 Laboratory personnel assigned to perform hazardous waste disposal procedures must have a working knowledge of the established procedures and practices outlined in the Site HSP. These employees must have training on the hazardous waste disposal practices initially upon assignment of these tasks, followed by an annual refresher course.

## **6.0 EQUIPMENT AND SUPPLIES (Applies to one well assembly)**

- 6.1 QED™ Sample Pro Portable Sampling Pump (or equivalent)
- 6.2 Well-specific polyethylene tubing
- 6.3 Safety line or cable for securing pump
- 6.4 Water-level meter or QED™ draw down device
- 6.5 QED™ Model MP10 - Electronic Programmable Controller (or equivalent)
- 6.6 QED™ Model MP20 - Micropurge Basics Flow Cell (or equivalent)
- 6.7 Gasoline-driven generator with electric compressor unit.
- 6.8 Disposable bladders.
- 6.9 Calibration standards for conductivity and pH.
- 6.10 Hand Tools
  - 6.10.1 Screwdriver
  - 6.10.2 Socket set for well caps
  - 6.10.3 Set of open-end wrenches for the pump.
- 6.11 Personal Protection Equipment (PPE)
  - 6.11.1 Hard hats
  - 6.11.2 Steel-toed boots
  - 6.11.3 Disposable nitrile gloves
  - 6.11.4 Safety glasses
  - 6.11.5 Tyvec™ Suits (if site HSP requires it)
- 6.12 PID Meter for measuring organic vapors at the well head.
- 6.13 Graduated cylinder for measuring pump flow.

- 6.14** Folding table for sampling equipment.  
**6.15** Sample bottles, coolers, ice. See section 8.0.  
**6.16** 5-gallon plastic buckets for waste collection and decontamination of equipment.

## 7.0 REAGENTS AND STANDARDS

- 7.1** Deionized (DI) water.  
**7.2** Liquinox<sup>TM</sup> for decontamination activities.  
**7.3** Standards for pH calibration of flow cell meter. Standards for pH of 7.0 and 10.0.  
**7.4** Standard for conductivity calibration of flow cell meter.

## 8.0 SAMPLE COLLECTION, PRESERVATION, AND STORAGE

- 8.1** Samples are collected in appropriate bottles, sealed in ziplock plastic bags, and stored in a cooler with ice in the field. Wet ice is used to keep the coolers chilled. The ice should be transferred to 1-gallon ziplock bags to limit water leakage from melting ice and to allow for better placement of ice around sample bottles. The following table shows the bottles to be collected for each method with the appropriate preservative.

Methods	Bottles	Preservative	Extraction Holding Times	Analysis Holding Times
EPA 8260B – VOCs	3-40 mL VOA vials	HCl, 4 °C	NA	14 Days
EPA 8270C – SVOCs	1 L amber glass bottle (1 to 2 bottles)	4 °C	7 Days	40 Days
EPA 8081A – Pesticides	1 L amber glass bottle (1 to 2 bottles)	4 °C	7 Days	40 Days
EPA 8151A - Pentachlorophenol	1 L amber glass bottle ( 1 to 2 bottles)	4 °C	7 Days	40 Days
EPA 6020 –Metals, Total	500 mL HDPE	HNO <sub>3</sub> , 4 °C	NA	6 months
EPA 6020 –Metals, Dissolved	500 mL HDPE	4 °C <sup>(1)</sup>	NA	6 months
EPA 7470A –Mercury, Total	500 mL HDPE	HNO <sub>3</sub> , 4 °C	NA	28 Days
EPA 7470A –Mercury, Dissolved	500 mL HDPE	4 °C <sup>(1)</sup>	NA	28 Days
EPA 300.0 – Chloride, Sulfate	250 mL HDPE	4 °C	NA	28 Days
EPA 353.3 - Nitrate/Nitrite	250 mL HDPE	H <sub>2</sub> SO <sub>4</sub> , 4 °C	NA	28 Days
EPA 310.1 – Alkalinity	250 mL HDPE	4 °C	NA	14 Days
EPA 415.1 – Total Organic Carbon	250 mL HDPE	H <sub>2</sub> SO <sub>4</sub> , 4 °C	NA	28 Days
EPA 350.2 - Ammonia	1000 mL HDPE	H <sub>2</sub> SO <sub>4</sub> , 4 °C	NA	14 Days
EPA 160.1 – Total Dissolved Solids	250 mL HDPE	4 °C	NA	7 Days
RSK175 - Methane	3-40 mL VOA vials	4 °C	NA	7 Days

### Notes:

- 1) Lab will filter and preserve upon receipt  
 EPA – U.S. Environmental Protection Agency  
 HCl – hydrochloric acid  
 HDPE – high density polyethylene  
 HNO<sub>3</sub> – nitric acid  
 H<sub>2</sub>SO<sub>4</sub> – sulfuric acid  
 NA – not applicable

SVOCs – semivolatile organic compounds  
VOA – volatile organic analysis  
VOCs – volatile organic compounds

## 9.0 QUALITY CONTROL

- 9.1 Trip blanks – Provided in each cooler containing sample vials for volatile analyses. The trip blanks are prepared and supplied by the laboratory. The trip blanks are initiated at the time the sample holding cooler is readied with ice for the field.
- 9.2 Field blanks – Blank samples created in the field by filling appropriate sample containers with deionized water and sealed, labeled and stored the same as the other samples. They measure the amount of contamination caused by the ambient air in the field. Prepared at the samplers discretion.
- 9.3 Field duplicates – prepared at a ratio of 1 in 10 samples collected for a site. A sample is collected in duplicate for the same analyses as the original sample and given a sample number different from the original sample. This is a blind duplicate for the laboratory. This QC is used to measure precision of the sampling method.
- 9.4 Matrix spike/matrix spike duplicate – The field sampler designates (on the COC) a sample to be prepared as a matrix spike/matrix spike duplicate by the laboratory. Double the volume must be collected for this sample, except for the extractable methods (e.g., 8270C and 8081A). The extractable methods need triple the volume of a regular sample. This QC is used to measure accuracy and precision in the presence of matrix interference.
- 9.5 Equipment rinsate samples – These are prepared by pouring deionized water over the decontaminated equipment to measure the effectiveness of the decontamination procedures. Collected one each day or one per site, whichever is more frequent. This QC measures the effectiveness of the decontamination procedure for equipment that is not discarded between wells and comes in contact with each of the well samples.

## 10.0 CALIBRATION

- 10.1 **Flow cell calibration** - The flow cell meter is used to measure pH, temperature, dissolved oxygen, conductivity, and ORP during well purging. The meter should be calibrated at the beginning of the day for pH, conductivity, and dissolved oxygen. The meter should be calibrated for pH using two standards (7.0 and 10.0). The instrument should be calibrated for conductivity and dissolved oxygen following the instructions provided with the instrument manual.
- 10.2 **Turbidity meter calibration** – Follow instructions provided with the instrument.
- 10.3 **PID meter calibration** – Follow instructions provided with the instrument.

## 11.0 PROCEDURE

### 11.1 Cooler Preparation

- 11.1.1 Prepare enough coolers for each day's sampling to accommodate the projected number of samples. Transfer wet ice to large ziplock bags to keep the water from the melting ice contained. Prepare about 4 to 5

ziplock bags of ice per cooler. Prepare a trip blank for each cooler that will contain samples for volatile analyses and note it on the respective COC.

## **11.2 Pre-Sampling Activities**

- 11.2.1** Start at the well known or believed to have the least contaminated ground water and proceed systematically to the well with the most contaminated ground water.
- 11.2.2** Check the well, the lock, and the locking cap for damage or evidence of tampering. Record observations.
- 11.2.3** Lay out sheet of polyethylene for placement of monitoring and sampling equipment or keep equipment stowed in clean garbage bags when not in use.
- 11.2.4** Remove well cap and measure VOCs at the rim of the opened well with a PID instrument and record the reading in the field logbook.
- 11.2.5** If the well casing does not have a reference point (usually a V- cut or indelible mark in the well casing), make one. Note that the reference point should be surveyed for correction of ground water elevations to the mean geodesic datum (MSL).
- 11.2.6** Measure and record the depth to water (to 0.01 ft) in all site wells to be sampled prior to purging. Care should be taken to minimize disturbance in the water column and dislodging of any particulate matter attached to the sides or settled at the bottom of the well.
- 11.2.7** If desired, measure and record the depth of any NAPLs using an interface probe. Care should be taken to minimize disturbance of any sediment that has accumulated at the bottom of the well. Record the observations in the logbook. If LNAPLs and/or DNAPLs are detected, the well will not be sampled by low-flow purge according to this procedure.

## **11.3 Preparation and Insertion of Pump**

- 11.3.1** Using the depth-to-water measurement, the person preparing the pump will determine the appropriate depth for the pump inlet. Record that depth in the log. The pump inlet should be set at the mid-point of the screen interval or at the mid-point between the depth-to-water and the bottom of the screen interval, whichever point is deeper. The pump intake should never be set less than 2 feet from the bottom. The pump intake must be kept at least two (2) feet above the bottom of the well to prevent disturbance and resuspension of any sediment or NAPL present in the bottom of the well. If there is 2 feet or less of water in the well, it will be considered unsuitable for low-flow sampling and so noted in the logbook.
- 11.3.2** Pre-cut well-specific tubing will be available for each well to be sampled. It will be stored in an individual garbage bag to prevent contamination of the tubing. Note: For the Camp Pendleton wells, the length of the tubing was cut to equal the depth-to-bottom of each well. This should provide enough length to allow for the seasonal changes in

depth-to-water and also enough length to allow for hook up to the controller.

- 11.3.3 The well-specific tubing should be attached to a fully decontaminated bladder pump (with new disposable bladder). Pump assembly should be according to manufacturer instructions. A safety line is attached to the pump for lowering and securing the pump at depth. The pump is slowly lowered into the well in a manner that will minimize disturbance of the water column and then is secured at the predetermined depth using the safety line.
- 11.3.4 The excess tubing remaining outside the well should be secured and covered with a clean garbage bag in order to prevent contamination. The well should be coned off, if necessary, to prevent foot and vehicle traffic in the area while waiting for the sampling team.
- 11.3.5 This pump placement person will then move on to the next pump and well.

#### 11.4 Sampling

- 11.4.1 Attach the air-line to the controller and compressor and the water line to the flow cell.
- 11.4.2 Before starting the pump, measure the water level again with the pump in the well. Leave the water level measuring device in the well.
- 11.4.3 Start the compressor. Mark this time down as the pump start time in the purge log and mark the liters purged as 0 liters. All other parameters should be marked null with a “—”. Using a graduated cylinder, measure the flow of the water and adjust it to between 150 and 500 ml per minute. Flow will depend on the depth of the well and drawdown. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 ft or less). Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. Care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment. The water level should be monitored approximately every five minutes. If a drawdown monitoring device is used, the water level can be monitored continuously.
- 11.4.4 Monitor Indicator Parameters: During purging of the well, monitor and record the field indicator parameters (temperature, specific conductance, pH, conductivity, ORP, turbidity, and DO) approximately every 3 to 5 minutes. These readings must be recorded in the purge log. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings within the SAP-specified control limits. Dissolved oxygen and turbidity usually require the longest time to achieve stabilization. The pump must not be removed from the well between purging and sampling. Once the readings are within control limits, then the well is considered stable and ready for sampling.

- 11.4.5** Disconnect the tubing from the flow cell, allowing the tubing to drain into the waste container directly. Bypassing the flow cell during sample collection reduces the chance of cross-contamination from the flow cell. With the pump operating at about 100 ml/minute, collect the volatile samples. VOC samples must be collected first and directly into sample containers. All VOC sample containers should be filled with minimal turbulence by allowing the ground water to flow from the tubing gently down the inside of the container. Flow can be increased to between 350 and 500 ml/minute to speed the sampling process when filling all other sample containers (if the water level is not impacted). The pump should be shut off when sampling is completed. Label the bottles and complete the COC. Seal the bottles in ziplock bags before placing them in the cooler.
- 11.4.6** With the pump slightly raised above the water level in the well, start the pump again to draw out residual well water from the tubing. Extract the pump from the well and prepare it for decontamination. Disconnect the tubing from the pump and place it in a new garbage bag. Label the bag with the well location ID # and store it carefully away. The pump is disassembled, the bladder disposed, and the pump is decontaminated.
- 11.4.7** Measure and record well depth.
- 11.4.8** Close and lock the well.
- 11.5** Decontamination of nondisposable sampling equipment is performed to prevent the introduction of extraneous material into samples and to prevent cross-contamination between samples. The pump apparatus will be decontaminated by washing with a nonphosphate detergent such as Liquinox™ or equivalent, then a primary rinse in potable water, and then a secondary rinse in deionized water. Decontamination water will be collected for disposal with the purge water. The following steps will be followed for general decontamination of nondisposable sampling equipment:
- 11.5.1** Wash with nonphosphate detergent and water solution. — This step will remove all visible contamination from the equipment. Using a 5-gallon bucket a long-handled brush is suggested for this step. Smaller bottlebrushes are available for some of the pump orifices.
- 11.5.2** Rinse with potable water. — This step will rinse all the detergent solution away from equipment. Using a 5-gallon bucket approximately 75 percent full of water. Periodic changing of this water is required.
- 11.5.3** Rinse with deionized water. — This step will rinse any detergent solution and potable water residues. Periodic changing of this water is required.
- 11.5.4** At the end of each sampling day, the equipment should be decontaminated the same as each well. The flow cell should also be decontaminated and packed up. An equipment rinsate should then be collected (for all volatile and semivolatile organic analyses for that day) by pouring deionized water over the end of the pump apparatus into the bottles.

## 12.0 DOCUMENTATION PROCEDURES

- 12.1 Sample Labeling and Documentation. Sample labels will be filled out with indelible, black ink, and will be affixed to each sample container. Sample containers will be placed in resealable plastic bags to protect the sample from unnecessary exposure during transportation to the laboratory. Each sample container will be labeled at a minimum with the following:
- Sample identification number
  - Sample collection date (month/day/year)
  - Time of collection (24-hour clock)
  - Project number (i.e., 829771)
  - Sampler initials
  - Analyses to be performed
  - Preservation (if any).
- 12.2 Sample Identification - Each sample will be identified by a 9-digit number (XXXXXX-YYYY) as follows:
- XXXXXX: 6-character designation of the project number and site location (e.g., 829771).
  - YYYY: 4-character designation of the consecutive sample number (e.g., 0001).
- For example, in the sample identification number 829771-0004, "829771" represents the project number and "0004" represents the fourth sample collected for the project.
- 12.3 A detailed description of the sample, including detailed sample location information, will be recorded in the field logbook and sample tracking log. The sample description will also be recorded on the COC form in the "Sample Description" column.
- 12.4 Sample Handling, Packaging, and Shipping
- 12.4.1 Immediately after sample collection, sample labels will be affixed to each sample container. Each sample will be placed in a resealable plastic bag to keep the sample container and label dry. All glass containers will be protected with bubble wrap, if transported by a commercial carrier.
- 12.4.2 Each cooler will be shipped with a temperature blank. A temperature blank is a sample container filled with tap water and stored in the cooler during sample collection and transportation. The temperature of the temperature blank will be recorded by the laboratory immediately upon receipt of the samples.
- 12.4.3 Sample cooler drain spouts will be taped from the inside and outside of cooler to prevent any leakage.
- 12.4.4 Samples to be shipped by commercial carrier will be packed in a sample cooler lined with a plastic bag. Ice, sealed in plastic bags, will be added to the cooler in sufficient quantity to keep the samples cooled to  $4 \pm 2$  degrees Celsius for the duration of the shipment to the laboratory. Saturday deliveries must be coordinated with the laboratory and the airbill and cooler marked appropriately. The COC will be completed and signed by the laboratory-assigned courier. The cooler may then be released to courier for transportation to the laboratory.

- 12.4.5 If a commercial carrier is used, the COC form will include the airbill number in the "transfers accepted by" column and will be sealed in a resealable bag. The COC will then be taped to the inside of the sample cooler lid. The cooler will be taped shut with strapping tape, and two custody seals will be taped across the cooler lid; one seal in the front and one seal in the back. Clear tape will be applied to the custody seals to prevent accidental breakage during shipping. The samples will then be shipped to the analytical laboratory. A copy of the courier airbill should be retained for documentation.
- 12.5 Field Documentation - At a minimum, sampling information will be recorded in a COC form and Field Logbook. Both documents will be completed in the field at the time of sample collection. All entries will be legibly recorded in indelible black ink. Changes or corrections on any project documentation will be made by crossing out the item with a single line, initialing (by the person performing the correction), and dating the correction. The original item, although erroneous, must remain legible beneath the cross out. The new information should be written above the crossed-out item. Corrections must be written clearly and legibly with indelible ink.
- 12.6 Sample Tracking Log, is a copy of the field sample log for tracking of sample information.
- 12.7 Chain-of-Custody -The following will be recorded on the COC:
- Project name
  - Project location
  - Project number (IT)
  - Project contact (IT)
  - Client representative
  - Project Manager (IT)
  - Sample numbers
  - Date (of sample collection)
  - Time (of sample collection to the nearest minute, military time)
  - Sample type (composite or grab)
  - Sample description (location and matrix)
  - Number of sample containers
  - Analysis required
  - Remarks: MS/MSD samples
  - Photoionization detector readings
  - Observations specific to sample
  - Item numbers (to be relinquished)
  - Transfer signature (to relinquish samples).
  - The sampler will be the first person to relinquish sample possession.
  - Courier/laboratory representative signature (for commercial carrier, record airbill number here)
  - Date/time (of custody transfer)
  - Additional remarks
  - Transportation method

- Laboratory name
- Turnaround time requirement
- Compositing instruction (if needed)
- Sampler signature

12.8 All entries in the field logbook will be executed in indelible black ink. Corrections will be made by crossing out erroneous data with a single line and dating and initializing the entry. At the end of each workday, the logbook pages will be signed by the responsible sampler and any unused portions of logbook pages will be crossed out, signed, and dated.

12.8.1 At a minimum, the logbook will contain the following information:

- Project name and location
- Date and time
- Personnel in attendance
- General weather information
- Work performed
- Field observations
- Sampling performed, including specifics such as location, type of sample, type of analysis, and sample identification
- Field analyses performed, including results, instrument checks, problems, and calibration records for the field instrumentation
- Descriptions of deviations from the SAP
- Problems encountered and corrective actions taken
- Identification of field QC samples
- QC activities
- Verbal or written instructions
- Any other events that may affect the samples.

### 13.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

- 13.1 This procedure does not contain any specific modifications that serve to minimize or prevent pollution.
- 13.2 Waste generated in the procedure must be segregated and disposed according to the facility/site hazardous waste procedures. The Health and Safety Director should be contacted if additional information is required.

#### 14.0 REFERENCES

- 14.1 SW846, *Test Methods for Evaluating Solid Waste*, Third Edition, Update III, December 1996.
- 14.2 EPA/540/S-95/504, *Low-Flow (Minimal Drawdown) Ground-Water Sampling Techniques*, Robert W. Puls and Michael J. Barcelona, April 1996
- 14.3 *Groundwater Sampling Procedure: Low Stress (Low Flow) Purging and Sampling*, USEPA Region II, [www.epa.gov/Region2/desa/hsw/lowflow.txt](http://www.epa.gov/Region2/desa/hsw/lowflow.txt)
- 14.4 San Diego County, 2001, *Site Assessment and Mitigation (SAM) Manual*, Department of Environmental Health.
- 14.5 *DNAPL Site Evaluation*, Robert M. Cohen and James W. Mercer, April 1993.

## **APPENDIX B RESPONSE TO REVIEW COMMENTS**

**RESPONSE TO COMMENTS – GROUNDWATER QUALITY BASELINE SAMPLING AND ANALYSIS PLAN**  
**IR SITE 7, Box Canyon Landfill**  
**Marine Corps Base Camp Pendleton, Camp Pendleton, California**  
**IT Project No. 829771, Contract Task Order 0080, Document Control Number 4434, Revision 0, dated October 3, 2002**

Comment No.	Section/Page Number	Comment	IT's Response
<b>General Comment from Beatrice Griffey, Associate Engineering Geologist, San Diego Regional Water Quality Control Board, dated November 1, 2002</b>			
1.		<p>The activities proposed in the SAP are considered to be deficient in the following areas: determination of the water table elevation southeast of the site, assessment of the background condition of ground water, consideration and evaluation of temporal fluctuations in the chemistry and condition of ground water, vertical assessment of ground water quality, evaluation of the nature and source of water in GP-10 @ 84', and the consideration of all relevant water quality standards. With the exception of the source of water in GP-10 @ 84', these issues are fundamental elements required to develop a scientifically sound and defensible ground water detection monitoring program and site conceptual model (United States Environmental Protection Agency (US EPA) 1988a, 1988b, 1992, and 2000), and are required by site specific Applicable or Relevant and Appropriate Requirements (ARARs; IT, 1999). Specific concerns and SAP modifications/revisions are discussed below in detail.</p> <p>Due to spatial constraints, the construction of the evapotranspiration cover required the destruction of the only ground water monitoring well located southeast of IR Site 7 (MW-03). Since the destruction of MW-03, the water table elevation along the entire southeastern perimeter of the site has not been monitored. Such information is necessary to generate a potentiometric map and site conceptual model, to determine the vertical separation between waste and ground water, to ensure site conditions are in compliance with ARARs, and may assist with the identification of the source of water in GP-10 @ 84'. Based on the presentation made to the FFA Team during a technical meeting (July 17, 2002), the installation of a minimum of two ground water monitoring wells, one east and one west of the Hillside Fault, is recommended.</p>	<p>Your comments will be addressed in the forthcoming monitoring plan that is to be developed on the basis of findings from the proposed sampling activities and data from the RI phase. As discussed in FFA technical meeting on 17 July 2002, this SAP outlines the sampling approach for the baseline event. The sampling approach for future postclosure monitoring events is subject to modification depending on actual results from the baseline. However, the common sampling and analytical procedures and QA/QC protocols will be used on all future events so that the sampling data are comparable.</p> <p>As explained above, the need of additional wells will be addressed in the forthcoming monitoring plan.</p>

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Comment No.	Section/Page Number	Comment	IT's Response
<b>General Comment from Beatrice Griffey, Associate Engineering Geologist, San Diego Regional Water Quality Control Board, dated November 1, 2002</b>			
1. (Cont.)		<p>An assessment of the physical and chemical properties of ground water outside the area of influence of the site (i.e. background) is required to provide substantive evidence of a release from the site, to establish site specific cleanup goals, and to ensure compliance with the State Water Resources Control Board Resolution 68-16 (California Antidegradation Policy, Statement of Policy with Respect to Maintaining High Quality of Waters in California), a site ARAR. The assessment of the background condition of ground water requires a ground water monitoring network that contains a sufficient number of appropriately located and constructed monitoring points (US EPA, 1992). The ground water monitoring network at the site is not designed to meet the requirements outlined in ground water monitoring ARARs (IT, 1999).</p> <p>The proposed Baseline investigation involves the performance of one ground water sampling event and the inclusion of contaminants in the post-closure monitoring plan only if the following conditions are encountered during the Baseline investigation:</p> <ul style="list-style-type: none"> <li>contaminant concentrations equal or exceed respective Maximum Contaminant Levels (MCLs), and</li> <li>for contaminants without established MCLs, contaminant concentrations exceed human health risk-based concentrations.</li> </ul>	<p>As explained above, your comments will be addressed in the forthcoming monitoring plan.</p> <p>As described in the data quality objectives (Section 2.1.5), we intend to use MCL and/or human health-risk based concentrations as the basic decision rules for establishing future monitoring plan. These criteria were proposed so that a measuring limit for the laboratory analysis could be set and that regulatory compliance limits are identified. We did not suggest that constituents with concentrations lower than MCLs or risk concentrations are to be excluded. In response to your comment, we will add a decision rule to clearly state that these constituents would be handled on a case by case basis and not to be excluded.</p>

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Comment No.	Section/Page Number	Comment	IT's Response
<b>General Comment from Beatrice Griffey, Associate Engineering Geologist, San Diego Regional Water Quality Control Board, dated November 1, 2002</b>			
1. (Cont.)		<p>Such an approach does not consider temporal fluctuations that occur in the subsurface environment and may result in a post-closure monitoring plan that does not address all the contaminants that pose a threat to human health and the environment. According to US EPA ground water monitoring guidance (2000), analytical data from a minimum of four ground water sampling events, conducted at a frequency that ensures independent samples, should be used to develop a list of contaminants to be included in a post-closure monitoring plan.</p> <p>The proposed ground water monitoring activities outlined in the SAP (Appendix A, Section 3.0) involve the collection and analysis of one sample from each well. In part, site specific ground water monitoring ARARs (IT, 1999) require that ground water monitoring networks are designed to allow the earliest possible detection and the comprehensive assessment (lateral and vertical extent, magnitude, and source identification) of releases from sites to ground water. Based on aquifer heterogeneities, types of contaminants disposed of at the site (IT, 1999 and 2002), and the potential presence of multiple phases of contaminants (gas, dissolved, and free); a vertical assessment of the condition and quality of ground water is required during this investigation. Such data is necessary to develop a scientifically sound site conceptual model, to ensure the earliest detection of the release of all potential contaminant phases, to minimize the extent and magnitudes of release associated ground water plumes, and consequently minimize corrective action costs to eliminate potential or existing threats to water quality. A potential option that may achieve this objective involves the collection and analysis of three depth discrete ground water samples from each ground water monitoring well. If appropriate and implementable, specific sampling depths are to be based on the behavior of the pollutants in the subsurface environment and aquifer heterogeneities. This information can be used to identify and sample the potentially most polluted hydrostratigraphic units.</p>	<p>As shown in Table 2-1, the on-site monitoring wells are all cluster wells with screen sections located at discrete hydrogeological units and/or depths. Unless the well screen was designed to measure free product NAPLs, it is generally recommended to take groundwater sample at the middle or upper middle section of the screen [USEPA, 1996, <i>Low-Flow (Minimum Drawdown) Ground-water Sampling Procedure</i>, EPA/540/S-95/504]. Your comments would be applicable if the actual type and extent of groundwater contamination justify depth-discrete sampling approach in a single screen or within a specific hydrogeological unit. However, historical data from the RI phase did not appear to support such scenario. We will evaluate the monitoring data to this aspect and address your comment in the forthcoming monitoring plan.</p>

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Comment No.	Section/Page Number	Comment	IT's Response
<b>General Comment from Beatrice Griffey, Associate Engineering Geologist, San Diego Regional Water Quality Control Board, dated November 1, 2002</b>			
1. (Cont.)		<p>The presence of water in landfill gas monitoring probe GP-10 @ 84' (IT, 2002) requires investigation from two perspectives. First, the elevation of the water level in the probe suggests there is a possibility IR Site 7 waste may be submerged in ground water. If such a condition exists at the site, the adequacy of the ground water monitoring network to detect and monitor the effects of such conditions on water quality will be required. An available option that may assist investigating the spatial relationship between the waste and ground water involves the installation and monitoring of ground water monitoring wells along the southeastern perimeter of the site. Secondly, an investigation of the nature and source of water in the gas probe is recommended. Immediately to the northeast of the gas probe is a potable water reservoir and distribution system (reservoir system) that, based on field observations, may be leaking significantly. Relevant field observations include</p> <ul style="list-style-type: none"> <li>• presence of water (several feet deep) in a shallow subsurface reservoir system vault just to the northeast of GP-10,</li> <li>• localized mounding of the water table,</li> <li>• presence of anomalously green vegetation along the subsurface conveyance line, and</li> <li>• continued rise in the water table in the area despite regional drought conditions.</li> </ul> <p>If the reservoir system is significantly leaking, the elimination of this anthropogenic source of water may lower the water table, and would represent a good faith effort on the bases behalf for the conservation of precious water resources. An available option that may address this issue involves comparing the analytical data from water samples collected from the gas probe with ground water samples collected from ground water monitoring wells.</p>	<p>We have been monitoring the groundwater level in GP-10 @84' for about 12 months. We will continue our monitoring activities and work with the Base in eliminating the reservoir leakage as suggested by your comments.</p>

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Comment No.	Section/Page Number	Comment	IT's Response
<b>General Comment from Beatrice Griffey, Associate Engineering Geologist, San Diego Regional Water Quality Control Board, dated November 1, 2002</b>			
1. (Cont.)		Based on Baseline investigation findings, the proposed decision rules for the inclusion of contaminants in the post-closure monitoring plan (MCLs and human health risk-based concentrations) address only one of the beneficial uses designated for the Santa Margarita River Hydrologic Unit in the RWQCB Basin Plan (1994, Municipal and Domestic Supply (MUN)), a site ARAR (IT, 1999). The Santa Margarita River Hydrologic Unit has numerous water quality standards (beneficial uses and water quality objectives; RWQCB Basin Plan, 1994) which are not addressed in the SAP. Commonly the concentration of constituents that are protective of human health are not protective of ecological receptors. As an example, the MCL for selenium is 50 ug/L, yet the United States National Recommended Ambient Water Quality Criteria and the California Toxics Rule Criteria for freshwater aquatic life protection (Continuous Concentration, 4-day average) is 5 ug/L (Marschack, 2000). Hence, the selenium MCL is not protective of aquatic ecosystems, a beneficial use designated for the Santa Margarita River Hydrologic Unit. Contaminant specific criteria are to be established at concentrations that are protective of the most reasonable sensitive water quality standard outlined in the RWQCB Basin Plan (1994).	As discussed above, your comments will be addressed in the forthcoming monitoring plan.

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Comment No.	Section/Page Number	Comment	IT's Response
<b>Specific Comments from Beatrice Griffey, Associate Engineering Geologist, San Diego Regional Water Quality Control Board, dated November 1, 2002</b>			
1.	Subsection 1.1	<p>Significant revisions and modifications are required to this Subsection to rectify numerous discrepancies (site history, signatories to the FFA, and outstanding issues) presented in this Subsection and that contained in numerous historical site specific documents contained in the RWQCB case file.</p> <ul style="list-style-type: none"> <li>Site History: According to this Subsection the "Marine Corps Base Camp Pendleton operated the Box Canyon Landfill between May 1974 and May 1984 as a Class II (non-hazardous) solid waste facility, which accepted waste that the base generated. The site accepted an estimated 1,093,000 cubic yards of waste during the 10-year operation." According to the Operable Unit 3 Record of Decision (OU 3 ROD; IT, 1999) and documentation contained in the RWQCB files, the Box Canyon Landfill is a Class III landfill. Additionally, from 1996 through April 2000, IR Site 7 was used as a Corrective Action Management Unit (CAMU; 40 Code of Federal Regulations, Part 264) which involved the disposal of hazardous wastes excavated from six other IR Sites (IT, 1999; Marine Corps Base Camp Pendleton (MCBCP), 2002). A detailed and comprehensive discussion of the use of the site as a CAMU for the IR Program; including volumes of waste disposed of, and types and the maximum concentration of contaminants in the waste; is warranted in this Subsection.</li> <li>State of California Signatories to the Federal Facility Agreement (FFA): According to this Subsection "...Federal Facility Agreement (FFA), which the base, EPA Region IX, California Department of Toxic Substances Control (DTSC), and San Diego Department of Environmental Health (DEH) signed in October 1990." According to the FFA (1990), the State of California Environmental Regulatory Agencies that signed the FFA are the Department of Health Services and the Regional Water Quality Control Board (San Diego).</li> </ul>	Your comments are noted. A more detailed site background history will be provided in the forthcoming monitoring plan.

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1. (Cont.)	Subsection 1.1	Outstanding site specific issues: According to this Subsection the outstanding issues at the site are drainage systems and perimeter roads. According to information presented to the FFA Team, an additional outstanding issue is the installation of a perimeter security fence.	
2.	Subsection 1.2	The frequency of post-closure activities should be based in part on the Baseline investigation findings. The inclusion of ground water monitoring well 1DW-01 (IT, 1999, Figure 2-11) in this investigation is required.	Your comments regarding the monitoring frequency and sampling of 1DW-01 will be addressed in the forthcoming monitoring plan. However, we will measure the groundwater level in 1DW-01 during the proposed baseline sampling activities for better groundwater hydrology evaluation.
3.	Subsection 2.1.1	There is a discrepancy in the date of the last sampling event performed at the site noted in Subsection 1.1 and that in Subsection 2.1.1.	The last sampling event was performed in August 1995. The noted discrepancy will be corrected.
4.	Subsection 2.1.2	Principal study question number 2 seems to require the installation of ground water monitoring wells southeast of the site to establish background conditions.	Your comments will be addressed in the forthcoming monitoring plan.
5.	Subsection 2.1.3	Clarify if the proposed activities include the collection and analysis of samples of waste, or will the information be acquired from historical documents or during a future investigation, refer to Bullet 3?	The proposed sampling activities are for groundwater only. Information from past investigations were used as input for developing the sampling plan. Past data will also be used in developing the final monitoring plan.
6.	Subsection 2.1.5	<p>The RWQCB does not concur with the proposed decision rule for the development of existing ground water monitoring wells, "If a well is found to have accumulated silt at an elevation greater than the midpoint of the well screen, the well will be developed." Additional objectives of well development are to optimize hydraulic communication between the formation and the well, aid in the collection of ground water samples with acceptable turbidity, and yield more representative ground water samples (Barcelona et al., 1985; Cal EPA, 1994). Hence it is reasonable to include the development of ground water monitoring wells in this investigation.</p> <p>The decision criteria proposed in the third and fourth bullet in this subsection require revisions to address all the relevant water quality standards, refer to the directive provided above in the General Comments Section, last paragraph.</p>	<p>All the monitoring wells were developed when installed. Therefore, unless there is an evidence (such as significant silt buildup in the screen section) to suggest that the well screen and/or pack is not functional for collecting representative samples, there is no reason that the well needs to be redeveloped. Redevelopment of a low yield wells also require much longer time to re-establish temporal equilibrium that will delay the proposed sampling activities further.</p> <p>As discussed in response to your general comment, we did not suggest to exclude any constituents with concentrations less than MCLs or risk-based action levels.</p>

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7.	Subsection 3.1, Third Paragraph	If appropriate, revise the first sentence to the following, "...depth to water and the bottom of the well."	The pertinent sentence will be changed to reflect the comment: "A water-level probe with 0.01-foot (ft) increments will be used to determine depth to water and the bottom of the well."
8.	Subsection 3.1, Fourth Paragraph	If appropriate, revise the first sentence to the following, "... and ground surface and top of well casing elevations."	The paragraph will be revised as follows: "In addition, survey coordinates for each well, including top of casing, top of monument, and ground surface elevations, will be measured by an approved subcontractor prior to sampling."
9.	Subsection 4.1	An assessment for the presence of hexavalent chromium during this investigation is recommended.	Since chromium is not a suspected contaminant in or near the landfill, samples will be analyzed for total chromium only. If chromium is detected in any baseline sample, the pertinent well will be re-sampled and analyzed for hexavalent chromium and total chromium.
10.	Subsection 4.4	The utility of source water blanks should be considered for this investigation. The analysis of source water blanks is necessary only when contaminants are encountered in equipment rinse blank samples to identify/eliminate possible contaminant sources.	Source water for equipment rinsates will be provided by the laboratory. The water will be certified as Type II water and a certification of analysis will be made available on request.
11.	Subsection 4.4.1	The consultants should consider implementing the following procedure to collect duplicate ground water samples that will not be analyzed for volatile organic compounds. Fill the sample bottle half full then fill the duplicate sample bottle half full, then fill the sample bottle three quarters full, then fill the duplicate sample bottle three quarters full, then completely fill the sample and duplicate sample bottles (Stockinger, 1998).	While recognizing the technical merits of the suggested sample collection procedure, IT proposes filling sample and sample duplicate containers in full and in sequence. The intent of the sample duplicate is to show variability in the matrix with respect to the contaminants of concern. By attempting to homogenize or average the contents of a sample and a sample duplicate, a true measure of matrix variability may be impacted.
12.	Subsection 4.4.3	Note there is a discrepancy in the type of water that will be used as a final rinse of field equipment during decontamination. According to Subsection 4.4.3 reagent-grade water will be used and according to Subsection 5.4 deionized water will be used.	Section 4.4.3 refers to the type of water to be used for the collection of the equipment rinsate (reagent-grade or source water). Section 5.4 refers to the type of water to be used in the final rinse of reusable equipment. Sentence two in Subsection 4.4.3 will be revised per the following: "Rinsate samples are generated by running laboratory supplied source water on or through nondisposable or non-dedicated equipment after the final rinse of the decontamination process."
13.	Subsection 4.4.5	During the investigation, field staff should use wet ice to preserve samples during transport to the laboratory. Wet ice has proven to be a more effective preservation method than "blue ice" (Kent and Payne, 1988).	Wet ice will be used to maintain cooler temperature between 2 and 6 degrees Celsius. Procedures for using wet ice are described in Subsection 5.7.3.

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Comment No.	Section/Page Number	Comment	IT's Response
<b>Specific Comments from Beatrice Griffey, Associate Engineering Geologist, San Diego Regional Water Quality Control Board, dated November 1, 2002</b>			
14.	Subsection 5.3	The RWQCB recommends the continuous acquisition of water level readings at thirty second intervals until three similar consecutive readings (within ~0.01 foot) are acquired (Stockinger, 1998). The benefits of wrapping glass sample containers in bubble wrap should be considered. Note there are slight discrepancies between the proposed activities outlined in the main text and that contained in Appendix A. As an example a well purge rate of 0.5 to 1.0 liters per minute is proposed in Subsection 5.3, yet according to Appendix A, Subsection 3.0 a well purge rate of 120 to 500 milliliters per minute is proposed. Please clarify if the activities that will be conducted at Site 7 are those outlined in the main text of the SAP or those in Appendix A, which may be an IT Micropurge standard operating procedure document. Flow rates recommended in US EPA Guidance (1996) are 0.1 – 0.5 L/min. Note that appropriate flow rates are dependent on well specific hydrogeology, hence wells with screened intervals in lithologies with lower hydraulic conductivities and permeabilities may require lower flow rates to ensure the maximum water table drawdown requirement (<0.3') is not exceeded.	<p>Subsection 5.3 is included in the SAP as a summary describing Micropurge procedures. Appendix A is an IT SOP and provides greater detail on Micropurge procedures. The following text will be included as the first sentence in Subsection 5.3: "Appendix A describes in detail the low-flow purging and sampling procedures to be used for this project."</p> <p>The first sentence in Subsection 5.3, Item 3 will be modified to reflect similar text in Appendix A, Subsection 3.0: "Attach the pump to a compressed air source so that the flow rate is approximately 120 to 500 milliliters per minute (mL/min)."</p> <p>The following text will be added to Subsection 5.3, Item 4 after the first sentence: "The purge flow rate will be reduced appropriately if the draw down at any time exceeds 0.3 feet below initial depth to water."</p>
15.	Subsection 5.4	If appropriate, delete the word visible from item 1.	The word 'visible' will be removed from Item 1.
16.	Subsection 5.5.2	Refer to Subsection 5.3 comment regarding requirements for water level readings.	This subsection describes the required elements of the water level measuring instrument and is not meant to describe how the instrument is to be used. Therefore, the title of this Subsection 5.5.2 will be changed to "Water Level Measurement Instrument."

**RESPONSE TO COMMENTS – GROUNDWATER QUALITY BASELINE SAMPLING AND ANALYSIS PLAN**  
**IR SITE 7, Box Canyon Landfill**  
**Marine Corps Base Camp Pendleton, Camp Pendleton, California**  
**IT Project No. 829771, Contract Task Order 0080, Document Control Number 4434, Revision 0, dated October 3, 2002**

Comment No.	Section/Page Number	Comment	IT's Response
<b>Specific Comments from Beatrice Griffey, Associate Engineering Geologist, San Diego Regional Water Quality Control Board, dated November 1, 2002</b>			
17.	Subsections 5.7.3 and 6.1	Copies of IT SOPs 1.1 and 2.1 should be provided as SAP appendices.	<p>The references to the IT SOPs will be deleted and the following revisions will be made to Subsection's 5.7.3 and 6.1:</p> <p>1) Subsection 5.7.3, paragraph 2  The first sentence will be deleted and the following text will be added after the second sentence: "Sufficient space between sample containers will be provided to place ice. Cooler lids will be secured with clear tape on both ends of the cooler. If a commercial carrier is used, nylon reinforced strapping tape will also be used to secure the cooler lid. Signed and dated custody seals will be placed over opposite ends of the cooler lid and secured with clear tape."</p> <p>2) Subsection 5.7.3, paragraph 3  The following sentence will be added after the second sentence: "Place two to four inches of adsorbent packing material (i.e., Vermiculite™) in the bottom of the sample cooler."</p> <p>3) Subsection 6.1, paragraph 1  The third sentence will be deleted.</p>
18.	Subsection 6.3	If appropriate, revise the last sentence of the second paragraph to the following, "...shipping personnel until receipt by the laboratory."	The sentence in question will be revised according to Comment 18.
19.	Subsection 6.5	Upon receipt of the samples, the laboratory representative should record all observations and measurements on the chain of custody.	The following text will be added to the second sentence in Subsection 6.5: "..., record all pertinent observations and measurements on the chain-of-custody form,..."
20.	Subsection 9.1	If appropriate, in the third paragraph, fourth sentence, replace analytical batch with instrument batch. The definition of sample delivery group (SDG) would be useful to reviewers with minimal knowledge of analytical laboratory processes and procedures.	Analytical batch will be replaced with instrument batch. The following text will be added as the final paragraph in Subsection 9.1: "A sample delivery group is a group of samples received collectively by the laboratory on the same day and which will be assigned the same unique laboratory project number."
21.	Subsection 9.2	If appropriate, in the first paragraph, first sentence, replace sample batch with sample delivery group (SDG). The definition of sample batch would be useful to reviewers with minimal knowledge of analytical laboratory processes and procedures.	Sample batch is the appropriate term. The first two sentences of Subsection 9.2, paragraph 1 will be revised to read as: "The method blank measures laboratory-introduced contamination for the sample batch, which is a group of samples that undergoes the same preparation procedure at the same time along with a method blank. Batch corrective action is initiated when contamination is found."

**RESPONSE TO COMMENTS – GROUNDWATER QUALITY BASELINE SAMPLING AND ANALYSIS PLAN**  
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Comment No.	Section/Page Number	Comment	IT's Response
<b>Specific Comments from Beatrice Griffey, Associate Engineering Geologist, San Diego Regional Water Quality Control Board, dated November 1, 2002</b>			
22.	Table 2-1	Confirm and, if appropriate, make the following revisions to the contaminant specific MCLs noted in Table 2-1: benzene 1 ug/L, carbon tetrachloride 0.5 ug/L, 1,2 -dichlorobenzene 600 ug/L, 1,4-dichlorobenzene 5 ug/L, and hexachlorobenzene 1 ug/L (Marschack, 2000). The MCL for total trihalomethanes (sum of bromoform, bromodichloromethane, chloroform, and dibromochloromethane) is 100 ug/L (Marschack, 2000).	Table 2-1 has been revised to include the MCLs listed in Comment 22.
23.	Appendix A Subsection 1.2	Provide the Cohen & Mercer, 1993 reference in Appendix A, Subsection 14.0.	The Cohen & Mercer reference will be added to Appendix A, Subsection 14.0.
24.	Appendix A Subsection 3.1	If appropriate, consider the following revision to the first sentence, "Prior to purging the well, a depth-to-water (DTW)..." Additionally, the continuous acquisition of water level readings at thirty second intervals are required until three similar consecutive readings are acquired (Stockinger, 1998), refer to Subsection 5.3 comment above.	The first sentence will be revised accordingly in Appendix A, Subsection 3.1. Also, IT proposes water levels be monitored every two minutes along with the water quality parameters.
25.	Appendix A Subsection 3.2	Note, to ensure the recommended maximum water table drawdown (<0.3') is achieved, wells with screened intervals in zones with low hydraulic conductivities may require lower flow rates than proposed.	This is addressed in Appendix A, Subsection 4.1.
26.	Appendix A Subsection 4.1	If appropriate, consider the following revision to sentences discussing the maximum water table drawdown requirement (<0.3'), "...drop 0.3 feet below the initial water table level."	The recommended revision to the text will be added to Appendix A, Subsection 4.1.
27.	Appendix A Subsection 5.2.5	If appropriate, delete the reference to the Marine Corps Mountain Warfare Training Center.	The reference to the Marine Corps Mountain Warfare Training Center will be deleted.
28.	Appendix A Subsection 6.12	Note there is a discrepancy in the proposed use of the photoionization detector (PID) during this investigation. According to Subsection 6.12, the PID will be used to measure ambient air, yet according to SAP Subsection 5.3, the PID will be used to measure organic vapors in the well head.	Appendix A, Subsection 6.1.2 will be revised to read: "PID meter for measuring organic vapors at the wellhead."

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Comment No.	Section/Page Number	Comment	IT's Response			
Specific Comments from Beatrice Griffey, Associate Engineering Geologist, San Diego Regional Water Quality Control Board, dated November 1, 2002						
29.	Appendix A Subsection 8.0	The table below presents discrepancies noted in the proposed sample containers, preservation method, and analysis holding times proposed in the Subsection 8.0 table and that in Table 5-1.	The following table lists the revised sample collection criteria for the parameters mentioned in Comments 29. Both Appendix A, Subsection 8.0 and Table 5-1 will be revised accordingly.			
		Issue	Subsection 8.0	Table 5-1	Issue	Revision
		TOC Sample Container	HDPE	Amber Bottles	TOC Sample Container	HDPE
		Nitrate/Nitrite Preservation Method	H2SO4, 4o C	4o C	Nitrate/Nitrite Preservation Method	H2SO4, 4o C
		Methane Holding Time	7 days	14 days	Methane Holding Time	7 days
		Methane – Number of VOAs	2	3	Methane – Number of VOAs	3
		Nitrate/Nitrite Holding Time	28 days	48 hours	Nitrate/Nitrite Holding Time	28 days
30.	Appendix A Subsection 11.5.1	If appropriate, delete the word visible.	The word 'visible' will be removed from Appendix A, Subsection 11.5.1.			

**Cited References:**

Barcelona et al., 1985, *Practical Guide for Ground-Water Sampling*, Illinois State Water Survey Contract Report 374, November.

Cal EPA, 1994, *Monitoring Well Design and Construction for Hydrologic Characterization*, August.

FFA, 1990, *United States Environmental Protection Agency, Region 9, and the State of California, and the United States Department of the Navy, Federal Facility Agreement Under CERCLA Section 120.*

IT, 1999, *Final Record of Decision Operable Unit 3, Marine Corps Base Camp Pendleton, California*, January 11.

IT, 2002, *Final Baseline Perimeter Landfill Gas-Monitoring Report, Box Canyon Landfill (Installation Restoration Site 7), Camp Pendleton, California*, June 7.

Kent and Payne, 1988, *Sampling Groundwater Monitoring Wells, Special Quality Assurance and Quality Control Considerations*, in *Principles of Environmental Sampling*, American Chemical Society Professional Reference Book, Edited by L.H. Keith.

Marine Corps Base Camp Pendleton, 2002, *Community Relations Plan for Marine Corps Base Camp Pendleton Installation Restoration Program*, January.

Marschack, 2000, *A Compilation of Water Quality Goals*, California Environmental Protection Agency, Regional Water Quality Control Board, Central Valley Region, August.

**RESPONSE TO COMMENTS – GROUNDWATER QUALITY BASELINE SAMPLING AND ANALYSIS PLAN**  
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**Marine Corps Base Camp Pendleton, Camp Pendleton, California**  
**IT Project No. 829771, Contract Task Order 0080, Document Control Number 4434, Revision 0, dated October 3, 2002**

***Cited References (Continued):***

*RWQCB Basin Plan, 1994, Water Quality Control Plan for the San Diego Basin (9), California Regional Water Quality Control, San Diego Region, September 8.*

*Stockinger, 1998, Field Guidance Manual, Minnesota Pollution Control Agency, July.*

*US EPA, 1988a, Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites, Office of Solid Waste and Emergency Response Directive 9283.1-2, December.*

*US EPA 1988b, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Office of Solid Waste and Emergency Response Directive 9355.3-01, October.*

*US EPA, 1992, RCRA Ground-Water Monitoring: Draft Technical Guidance, Office of Solid Waste, November.*

*US EPA, 1996, Low-Flow (Minimal Drawdown) Ground-water Sampling Procedures, EPA/540/S-95/504, April.*

*US EPA, 2000, RCRA, Superfund & EPCRA Hotline Training Module, Introduction to Groundwater Monitoring, Office of Solid Waste and Emergency Response, EPA530-R-99-049, February.*

**RESPONSE TO COMMENTS – GROUNDWATER QUALITY BASELINE SAMPLING AND ANALYSIS PLAN**  
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**IT Project No. 829771, Contract Task Order 0080, Document Control Number 4434, Revision 0, dated October 3, 2002**

Comment No.	Section/Page Number	Comment	IT's Response
<b>Specific Comments from Mr. Tayseer Mahmoud, Department of Toxic Substances Control, November 6, 2002</b>			
1.		<p>The Record of Decision (ROD) for Operable Unit 3 has designated IR Site 7 as a Corrective Action Management Unit (CAMU). Please provide an evaluation how the SAP complies with all the Applicable or Relevant and Appropriate Requirements (ARARS) listed in Table B-2 of the ROD with respect to Article 6 of Title 22, California Code of Regulation (22 CCR), Sections 66264.94 and 66264.98).</p>	<p>As stated in Section 1.2, this SAP is to implement a baseline study so that a site-specific post-closure monitoring plan can developed. The SAP establishes the basic sampling procedures and QA/QC protocols that would be consistently used in all future monitoring activities. This SAP, however, is not yet a monitoring plan to address ARARs stipulated under 22CCR66264.94 through 66264.98 as noted in your comments. Therefore, your comments will be addressed by the forthcoming monitoring plan.</p>
2.	Section 2.1.5, Development of a Decision Rule	<p>The proposed baseline investigation and the inclusion of contaminants in the post-closure monitoring plan based on the results of one groundwater sampling event are not acceptable.</p> <p>Using the maximum contaminant levels (MCLs) as the "cutoff" for Chemicals of Concern (COCs) is not in accordance with 22 CCR Article 6 detection groundwater monitoring. By using the MCLs as the "cutoff" for COCs included in the post-closure monitoring plan, releases from the regulated unit potentially will not be identified. Pursuant to 22 CCR 66264.98 (which includes 66242.97[b](1)), groundwater samples should "represent the quality of water that has not been affected by a release from the regulated unit."</p> <p>In addition, 22 CCR 66264.552(e)(3)(A) of the CAMU regulations require to "continue to detect and the characterize the nature, extent, concentration, direction, and movement of existing releases of hazardous constituents in groundwater from sources located within the CAMU."</p>	<p>We proposed the use MCLs and risk-based concentration if MCLs are not yet established as the basis for basic decision rules for establishing future monitoring plan. These criteria were proposed so that a measuring limit for the laboratory analysis could be set and that regulatory compliance limits are identified. These criteria, however, are not used as "cutoff" for COC selections as noted in your comments. We did not suggest that constituents with concentrations lower than MCLs or risk-based concentrations are to be excluded. In response to your comment, we will add a decision rule to clearly state that these constituents would be handled on a case by case basis and not to be excluded.</p>

**RESPONSE TO COMMENTS – GROUNDWATER QUALITY BASELINE SAMPLING AND ANALYSIS PLAN**  
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**IT Project No. 829771, Contract Task Order 0080, Document Control Number 4434, Revision 0, dated October 3, 2002**

Comment No.	Section/Page Number	Comment	IT's Response
<b>Specific Comments from Mr. Tayseer Mahmoud, Department of Toxic Substances Control, November 6, 2002</b>			
3.	Section 2.2.6, Analytical Methods	Please ensure that the constituents listed for each test method are the complete list for each method and not an abbreviated list. At a lower frequency, the downgradient wells should also be tested for 1,4-Dioxane and all potential waste disposed in the landfill such as explosives and their chemical products, PCBs, dioxins, etc.	As stated above, this is a baseline sampling event. 1,4-Dioxane is a solvent additive. There were no previous elevated detections of solvents to justifying sampling for 1,4-Dioxane at this time. MCB Camp Pendleton is a training base and not known to have operation related to development, testing, and/or treatment/disposal/storage of rocket fuel or explosives. There is no justification to include explosives as part of the monitoring activities. PCBs and dioxins were investigated in the past RI and/or recent OU-4/OU-5 activities. Wastes known to be associated with PCBs and dioxins (e.g., wastes from IR Site 3 and 6) were solidified into non-leachable inert waste before disposal at the CAMU. Therefore, there is no justification to test for these compounds either.
4.	Section 4.3 and 7.2, Project-Required Reporting Limits (RL)	The project reporting limits should be the method detection limit (MDL) for each constituent for each method not the RL listed in Table 2-1. The detection limits should also be appropriate to meet study objectives to protect human health and any sensitive receptors identified in the site conceptual model. Therefore, it is not appropriate for MCB Camp Pendleton to report some chemicals only when they reach the MCL as shown in Table 2-1.	The laboratory will report any detection between the reporting limit and the method detection limit with appropriate data qualifier. All analytical methods being proposed have RLs lower than MCLs.
5.	Table 2-1	The units µg/kg should be deleted from the footnote of the table because they are units used for soil not groundwater.	The unit will be removed from Table 2-1.

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**From:** Bilodeau, Michael J (EFDSW) [BilodeauMJ@efdswnavfac.navy.mil]  
**Sent:** Friday, January 17, 2003 3:07 PM  
**To:** Beatrice Griffey RWQCB; Bill Mabey; La Rae Landers ES-MCCP; Martin @ home; Martin Hausladen EPA; Tayseer Mahmoud  
**Cc:** 'Pan, Ta-Cheng (Max)'; Stewart, Kathryn A (EFDSW); Buckner, Geoff T (PWCSO 980); Beverly, Kathie J (EFDSW)  
**Subject:** RE: SITE 7 GW SAP RTC

To help facilitate the Field Sampling event for site 7 which is coming up the week of 20 January 2003 we will be furnishing our clarifications to several e-mails received from the State via this e-mail. All comments have been addressed in the Response to Comments (RTC) and will be incorporated into the final Sampling and Analysis Plan (SAP) under the comment section. The following three e-mails from the RWQCB (2) and DTSC (1) were received after the RTC went out so the Navy will respond also via e-mail where this response will in turn be incorporated into the SAP (and the admin record.)

**PART 1 DTSC COMMENTS:**

**Paragraph 1) Sample for all constituents - Baseline**

Answer: The Navy conducted baseline sampling at Site 7 as specified in the Draft Final Human Health Risk Work Plan (9 Nov 93) to facilitate the Phase 1 RI (10 Dec 93). This fulfills the requirements of California Code of Regulations, Title 22, Article 6. Corrective Action Management Unit (CAMU) I soils (circa 1996) were stabilized and CAMU II soils (circa 1999) passed SPLP to ensure non-leachability.

**Paragraph 2) Detection limits must meet ecological receptor standards**

Answer: Groundwater at Site 7 does not pose any ecological risk because there is not a complete groundwater pathway to cause an impact (Group B - Eco Risk Work Plan, dated 20 Aug 93).

**PART 2 RWQCB COMMENTS:**

**Question 1 - Well Development.**

Answer: Per the SAM Manual Section III C "Groundwater Sampling" and DTSC's WQSAP guidance it is not technically justifiable or economically feasible to re-develop wells for this sampling event. There is no identifiable source that suggests re-development of wells based solely on the length of time between sampling events. Also, sediment in the well screen interval is not anticipated to be a factor during this sampling event. For this event a well survey has already been conducted and each well will be re-inspected and sampled per the SAP.

**Question 2 - 1,4-Dioxane**

Answer: Without an identified solvent impact to the groundwater below Site 7, it is not technically justifiable or economically feasible to sample for 1,4 Dioxane. However, the RWQCB is invited to provide references on the characteristics of solvent stabilizer plume mobility to facilitate discussion on this issue. CAMU I soils (circa 1996) were stabilized and CAMU II soils (circa 1999) passed SPLP to ensure non-leachability.

Mike Bilodeau  
Remedial Project Manager  
Camp Pendleton AFT - Installation Restoration  
Navy Facilities Engineering Command, Southwest  
Phone: (619) 532-3829 DSN 522

Fax: (619) 532-4160

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-----Original Message-----

From: Beatrice Griffey [mailto:grifb@rb9.swrcb.ca.gov]  
Sent: Thursday, January 16, 2003 4:51 PM  
To: Bilodeau, Michael J (EFDsw); LandersLN@mail.cpp.usmc.mil;  
Max.Pan@shawgrp.com  
Cc: magnificentmoose@aol.com; TMahmoud@dtsc.ca.gov;  
bmabey@techlawinc.com  
Subject: Site 7 Ground Water Monitoring Well Development Issue

According to Ground Water Monitoring Well Maintenance Procedures (Barcelona et al., 1985, Page 45): "Hydraulic conductivity tests should be performed once every five years or whenever significant amounts (0.25 - 0.5 feet) of sediment have accumulated in the well. Deficiencies in well locations, decreases in hydraulic conductivity, or production of turbid samples should be corrected by well development, installation of new wells, or rehabilitation of existing wells." These well development criteria should be implemented at Site 7 during the upcoming baseline sampling event. The proposed well development criterion, > 0.5 filling of the screened interval of a ground water monitoring well with sediment, is considered unacceptable to the Regional Water Quality Control Board (San Diego). Input is being provided via electronic mail since the consultant wishes to commence field activities next week.

Cited Reference:

Barcelona et al., 1985, Practical Guide for Ground-Water Sampling, Illinois State Water Survey Contract Report 374, November.

Beatrice Griffey  
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-----Original Message-----

From: Tayseer Mahmoud [mailto:TMahmoud@dtsc.ca.gov  
<mailto:TMahmoud@dtsc.ca.gov>]  
Sent: Thursday, December 19, 2002 9:31 AM  
To: magnificentmoose@aol.com; UnderwoodPM@efds.w.navfac.navy.mil;  
grifb@rb9.swrcb.ca.gov; bmabey@techlawinc.com  
Cc: BilodeauMJ@efds.w.navfac.navy.mil; landersln@pendleton.usmc.mil;  
tpan@theitgroup.com  
Subject: Re: SITE 7 GW SAP RTC

Hi Team,

Thank you for sending responses to agencies comments. I want to echo the RWQCB concerns regarding the suite of chemical for the baseline sampling. We are not sure what was disposed in the landfill. California Code of Regulations, Title 22, Article 6 requires the baseline sampling to include everything. Also, I consulted with Manny

and he informed me that wastes from Sites 3 & 6 were solidified before disposal in 1996, however, wastes from other sites disposed in 1999 were not solidified.

The response to RWQCB comment on Page 10 of 15 should indicate that the Navy will ensure that the test methods will use detection limits that are adequate for the lower cleanup levels (ecological receptors). Navy should use the lower detection limits for this baseline sampling instead of waiting until the forthcoming monitoring plan is submitted to the agencies. Thank you.

Tayseer Mahmoud  
Office of Military Facilities  
Department of Toxic Substances Control  
5796 Corporate Avenue  
Cypress, California 90630  
Phone:(714) 484-5419  
Fax:(714) 484-5437

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>>> "Beatrice Griffey" <grifb@rb9.swrcb.ca.gov> 12/17/02 04:36PM >>>  
For the record, I have concerns with two DoN response to Agency comments

(RTC) regarding the Groundwater Quality Baseline Sampling and Analysis Plan, IR Site 7, Box Canyon Landfill, Marine Corps Base Camp Pendleton (SAP), prepared by IT, and dated 10/3/2002. Input is being provided via

email to expedite the process to allow SAP implementation this month. Please note that since my supervisor has not reviewed this email, this submittal is considered a draft version.

1. My request to redevelop the wells is considered unnecessary; refer to Comment Number 6, SAP Subsection 2.1.5. Following are issues that support my request: the wells have not been sampled, purged, or developed for several years; baseline investigation data will be used to

develop a postclosure monitoring sampling approach; and data acquired during the baseline investigation will be compared with data acquired during future postclosure investigation. Hence, based on the long term repercussions of not developing the wells, it would seem to be a prudent

decision at this point in time. Additionally, if my memory still serves

me, this issue was mentioned by a DTSC Geologist (Theodore Johnson) during the Technical Meeting held 7/17/2002.

2. My request to monitor ground water for the presence of waste disposed of at the landfill/CAMU is considered unjustified; refer to Comment 3, QAP Subsection 2.2.6. In part the lack of justification is based on the solvent concentrations encountered during previous ground water monitoring activities. Such an argument fails to account for difference between the physico-chemical properties of solvent additives

and solvents, which causes these contaminants to behave differently in the subsurface environment. Solvent stabilizers are more soluble, have lower adsorption coefficients, and have lower organic matter partitioning coefficients than solvents. Hence solvent stabilizer ground water plumes may be present further downgradient, detach from, and exist in the absence of the source solvent. Based on this fate and transport issue and the fact that dry cleaning sludges were disposed of at Site 7 (OU 3 ROD, Subsection 2.5.2) seems to warrant an assessment of the

presence of solvent stabilizers. An additional argument presented in the RTC is that waste disposed of in the CAMU (from IR Sites 3 and 6) were solidified into non-leachable waste prior to disposal at the CAMU. Please provide the supporting reference. This argument fails to consider the variety of waste disposed of during the ten years Site 7 was used as a Class III Landfill (OU 3 ROD, Subsection 2.5.2) and the fact that untreated hazardous substances removed from 4 other IR program

sites were disposed of in the CAMU. Hence it seems this request is justified.

Beatrice Griffey  
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>>> "Underwood, Patricia M (EFD SW)" <UnderwoodPM@efdswnavfac.navy.mil>  
12/11/02 04:40PM >>>

All,

I am making my meager attempt to fill in for Mike, since he is on baby leave for the next few days...

Please find attached the Site 7 Groundwater SAP RTC. After your review, please notify me if you feel that a phone conference will be necessary to discuss any of the comments. We are hoping to implement the SAP this month so we would like to work out any remaining issues as soon as possible.

<<RTC\_GW\_SAP.doc>>

Thank you,

Tricia

Patricia Underwood, Ph.D.

Remedial Technical Manager

Naval Facilities Engineering Command South West Division

Camp Pendleton Area Focus Team

619-532-4813

underwoodpm@efdswnavfac.navy.mil